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THE HAWAIIAN

FORESTER AND AGRICULTURIST

VOL. V JANUARY, 1908 No. 1

THE COLLEGE OF AGRICULTURE AND MECHANIC ARTS OF HAWAII.

BY WILLIS T. POPE.

Paper read before Farmers' Institute.

The College of Agriculture and Mechanic Arts first became known to the public in May, 1905. A Concurrent Resolution, framed by Mr. W. R. Farrington, was presented to the Legislature of the Territory by Representative Coelho, of Maui. A committee from the Department of Public Instruction was appointed to make investigation, and presented a report to the Legislature, resulting in the appointment of a special committee from the University Club, which framed two acts that were passed by the Legislature, establishing, and creating maintenance for the nucleus of the College of Agriculture and Mechanic Arts of Hawaii.

The Board of Regents have been actively at work since their appointment by the Governor, and, though many of their efforts have been fruitless, they have succeeded in securing over thirty acres of excellent land in Manoa Valley, and a temporary building is being remodeled and equipped on Young street, near Thomas Square. It has four class rooms, a laboratory room for chemistry and physics, an office, hall and verandas, with such equipments as furniture, chemicals, laboratory apparatus and reference books intended for the science library, all of which will be installed by February 3rd, when the institution will be opened for those desiring to prepare themselves for the regular college work leading to a degree of Bachelor of Science, which will open in September, 1908. Entrance examinations will be given during the three days previous to the opening of college.

Although it is not the intention of the Board to offer a preparatory course, several applicants not fully prepared to enter the regular college course desire to make a preparation. For this reason, arrangements have been made to open a preparatory course beginning February 3rd, and extending into the summer.

This will put the new college into active existence seven months earlier than otherwise.

The entrance requirements for this course will be a satisfactory examination in reading, spelling, writing, English grammar, arithmetic, geography, United States and Hawaiian history.

In arranging the course of study for our college while in its embryo, it is thought best to consider, for the present, one strong course, mainly agricultural, as a basis, establishing engineering and domestic science courses before the end of the year. This agricultural course is similar to that laid down by most of the leading Agricultural Colleges of the mainland. A few changes have been made to meet our peculiar conditions.

Algebra, Geometry and Trigonometry are given one term each. English of an advanced nature is given four terms, three terms of Botany, including 192 hours of laboratory work, two terms of Physics, with 120 hours of laboratory work; drawing will be extended through the course. Physiology and Astronomy will be given one term each. Military Drill, including military science, will be distributed throughout the course. Physical training is included for young women. Rhetoricals are a part of the work during the first three years. Horticulture is given six terms, with 288 hours of industrial. Agriculture four terms, 192 hours industrial. Modern Languages will include German, with French elective. There will be two terms of Chemistry, and two terms of Agricultural Chemistry, including Chemistry of Food and Food Preservation; all of the work in Chemistry requiring additional laboratory work. Geology is completed in one term. Industrial History and Industrial History of the United States, each one term. Zoölogy, including Entomology, is given two terms, with 96 hours of laboratory work. Institutional Government has been substituted in the place of Civil Government. Political Economy, Meteorology, Elementary Law, Logic, Psychology and Thesis have each been given a term. It is the intention to add courses of lectures in American History, English History, Continental History, American Literature, English Prose and English Poetry. Music is optional throughout the course.

Terms of admission to this regular course will be similar to those required by the best Agricultural Institutions.

The College recognizes the fact that there are many who cannot take the four years' course, and for such persons, *special* courses will be arranged to accommodate their needs. These courses, while not so complete and on a different plane, will be more largely a giving of facts without elaborating on the underlying principles which the regular courses will afford. It is hoped that those who feel that they cannot afford a four years' course, will be lead into the regular course by the taste of these educational advantages.

We are realizing the necessity of education *in* the work and not apart from it; the need of elevating labor so that it will be enjoyed and to look to him who is enabled by his education to

grape with nature, as our ideal. The man who has applied practice with principles is not only learning *why* and *how* to do, but to *do*.

The leading object of the college is to enable the student to grapple with the practical problems of industrial life, and to give the industrial classes a liberal education, which will apply to the character and general capacity of the student.

As set forth in the Act of 1862, giving lands for Agricultural Colleges, "the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning, as are related to Agriculture and the Mechanic Arts, in such maner as the Legislature of the 'Territory' may prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions in life."

AGRICULTURAL COURSE OF STUDY

FALL TERM.	Lab. Ind.	Class Periods	WINTER TERM.	Lab. Ind.	Class Periods	SPRING TERM.	Lab. Ind.	Class Periods
FRESHMAN YEAR								
Algebra	..	5	Geometry	..	5	Trigonometry, including Surveying	..	5
English	..	5	English	..	5	English	..	5
Botany	..	5	Botany	..	5	Physics	..	5
Laboratory	6	..	Laboratory	6	..	Laboratory	6	..
Drawing (Freehand and Mechanical)	..	5	Physiology	..	5	Astronomy	..	5
Military Drill or Physical Training	..	2	Military Drill or Physical Training	..	2	Military Drill or Physical Training	..	2
Rhetoricals	..	1	Rhetoricals	..	1	Rhetoricals	..	1
SOPHOMORE YEAR								
Enlish	..	5	Modern Language	..	5	Modern Language	..	2
Physics	..	5	Chemistry	..	5	Chemistry	..	6
Laboratory	4	..	Laboratory	4	..	Laboratory	4	..
Horticulture	..	5	Horticulture	..	5	Agriculture	..	5
Industrial	4	..	Industrial	4	..	Industrial	4	..
Military Drill	..	5	Military Drill and Military Science	..	1	Military Drill and Military Science	..	5
Rhetoricals	..	1	Rhetoricals	..	1	Rhetoricals	..	1
JUNIOR YEAR								
Modern Language	..	5	Modern Language	..	5	Ind. Hfstory, U S.	..	2
Agricultural Chem. and Chem. of Foods	..	5	Industrial History	..	5	Zoölogy, Entomology	..	5
Laboratory	4	..	Zoölogy, Entomology	..	5	Laboratory	4	..
Horticulture	..	5	Laboratory	4	..	Agriculture	.	5
Industrial	4	..	Horticulture	..	5	Industrial	4	..
Geology	..	5	Industrial	4	.	Institutional Govt	..	5
Lec. Am. History	..	1	Lec. Eng. History	..	1	Lec. Continental Hist.	..	1
Rhetoricals	..	1	Rhetoricals	..	1	Rhetoricals	..	[illegible]
Military Drill	..	2	Military Drill	..	2	Military Drill	..	2
SENIOR YEAR								
Political Economy	..	5	Elementary Law	..	5	Psychology	..	5
Agricultural Chem. and Food Preservation	..	5	Botany	..	5	Horticulture	..	5
			Laboratory	4	..	Industrial	4	..
Laboratory	4	..	Logic	..	5	Agriculture	..	5
Agriculture	..	5	Horticulture	..	5	Industrial	4	..
Laboratory	4	..	Industrial	4	..	Thesis	..	5
Meteorology	..	5	Lec. Eng. Prose	..	1	Lec. Eng. Poetry	..	1
Lec. Am. Literature	..	1						

GENERAL SUBJECTS OF AGRICULTURAL COURSE SHOWING NUMBER OF TERMS, PERIODS AND HOURS.

	Terms		Rec. Periods	Lab. Ind. Hrs.	
1	1	Algebra	60	....	
2	1	Geometry	60	....	
3	1	Trigonometry	60	....	
4	4	English	240	....	
5	3	Botany	180	192	
6	2	Physics	120	120	
7	1	Drawing	60	....	Also drawing in Lab. work
8	1	Physiology	60	....	
9	1	Astronomy	60	....	
10	6	Drill or Phys. Training	252	....	
11	9	Rhetoricals	108	....	
12	6	Horticulture	360	288	
13	4	Agriculture	240	192	
14	4	Mod. Lang. (German)	240	....	With French elective
15	2	Chemistry	120	96	
16	2	Agriculture, Chemistry,			
17		Chem. of Foods and			
18		Food Preservation	120	96	
19	1	Geology	60	....	
20	1	Industrial History	60	....	
21	1	Industrial History U. S.	60	....	
22	2	Zoölogy, Entomology	120	96	
23	1	Institutional Government	60	....	
24	1	Political Economy	60	....	
25	1	Meteorology	60	....	
26	1	Elementary Law	60	....	
27	1	Logic	60	....	
28	1	Psychology	60	....	
29	1	Thesis	60	....	
30	1	Lec. American History	12	....	
31	1	Lec. English History	12	....	
32	1	Lec. Continental History	12	....	
33	1	Lec. American Literature	12	....	
34	1	Lec. English Prose	12	....	
35	1	Lec. English Poetry	12	....	
			3132	1080	

Music optional throughout the course.

WAHIAWA.

This season, Wahiawa will produce the enormous crop of 13,000 tons of pineapples. As freight for the Wahiawa branch of the Oahu railway this will comprise 1,500 carloads, and will be contained in 350,000 cases. The Oahu Railway & Land Co. purposes opening to homesteaders portions of its lands on the north side of the island, which are well adapted to pineapple growing.

BOARD OF AGRICULTURE AND FORESTRY.

DIVISION OF FORESTRY.

ROUTINE REPORTS.

Honolulu, Hawaii, Dec. 18, 1907.

Board of Commissioners of
Agriculture and Forestry,
Honolulu.

Gentlemen:—

I have the honor to submit the following routine report of the Division of Forestry for the period from November 20 to date.

During the past month my own time has been largely taken up with the preparation of reports, with other matters in connection with proposed forest reserves, and with the routine work of the Division.

The most important matter that has occurred during the last month was the making public of an opinion rendered by the Attorney General of the Territory, Honorable C. R. Hemenway, as to whether the Board of Agriculture and Forestry had the power to sell the wood and other produce from forest reserves, the realization from such sales to be treated as a special fund for other forest work. Mr. Hemenway's opinion (which is numbered 42, and bears the date of November 19, 1907), is a document of far-reaching importance to forest work in Hawaii, for it deals exhaustively with several subjects of fundamental moment to the Board. It is published in full in The Forester and Agriculturist for December, 1907.

In connection with this opinion of the Attorney General, a conference was held on the morning of December 14 between the Acting Governor, the Attorney General, the Commissioner of Public Lands, the Chairman of the Forestry Committee and the Superintendent of Forestry in regard to the utilization of the produce of forests owned by the Territorial Government other than those in established forest reserves. It was decided that all matters having to do with forest utilization coming before the Land Commissioner should be referred to the Board of Agriculture and Forestry, who should make recommendations as to the best ways and means of accomplishing the result desired. This is a definite recognition of a usage which has been in force provisionally, for some time.

It was further decided that land under lease within the boundaries of established forest reserves was to be treated during the term of that lease in the same manner as Government forest lands not in the reserve. The Board controls and administers on its own behalf all forest land within the established forest reserves

that has been actually set apart, either directly by proclamation, or that comes into the fully reserved class through the expiration of leases in existence when the reserve was declared.

All matters in connection with the leasing of water, including the necessary rights of way, etc., remain in the control of the Land Commissioner and the revenue from this source forms a part of the realizations of his office. Hereafter in all Government leases a provision similar in character to the homesteading clause will be made to cover the withdrawal of land for forest purposes, upon a pro rata reduction of the rent.

ROUTINE WORK OF THE DIVISION.

From November 29th to December 10th, Mr. Haughs was on Maui making (1) an examination of some land in the Kaupo district under terms of Circular No. 1 of this Division, which offers advice and assistance to owners of forest lands on the management of their tracts; (2) an investigation of certain questions in the Koolau district; and (3) visits to forest nurseries at Haiku.

On November 26, in response to another application under the terms of Circular No. 1, Mr. Haughs visited the land of Waianae-uka in the Ewa district on this Island, and made a report which has been submitted to the lessees of that land.

NURSERY GROUNDS.

During the past fortnight, some minor changes have been made in the store-rooms and other subordinate buildings at the Nursery which will facilitate routine work. The grading of the grounds is going on gradually. In the end their appearance will be much improved.

Since November 20th, the library room of the Board has been used for the following meetings:

Hawaiian Poultry Association, November 20th and 25th, December 2nd, 4th and 9th.

Hawaiian Entomological Society, December 12th.

At the last named meeting Mr. W. A. Bryan gave an interesting talk on the organization and work of the Pacific Scientific Institution.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

Honolulu, Hawaii, January 8, 1908.

Board of Commissioners of
Agriculture and Forestry,
Honolulu.

Gentlemen:—

I have the honor to submit the following report for the Division of Forestry for the period from December 18 to date:

The work of the Division during this period has been mainly routine in character, consisting in the collection of material in regard to forthcoming reports, in details in regard to the compilation of lists of books to be ordered for the Library, and in other duties of a similar nature.

On December 21st, Miss Melika Peterson, the Clerk and Stenographer of the Board, left for California on a six months' leave of absence, granted by the Board. During her absence her place is filled by Miss Katherine Hannestad. As a matter of record it may be stated that Miss Hannestad actually began work on November 29th, substituting for Miss Peterson during the weeks that the latter was prevented by illness from attending to her regular duties. During this time, however, Miss Peterson kept a general oversight of the work and before leaving for the coast completed, as far as possible, all the unfinished business under her charge.

On January 2nd, Miss Eleanor B. Wirt was appointed to the statutory position of Clerk of the Division of Forestry, to undertake various pieces of clerical work that have for some time awaited attention.

POULTRY SHOW.

For the annual exhibition of the Hawaiian Poultry Association, held from January 8th to 11th, the Division of Forestry has prepared an exhibit of maps and charts illustrating the forest reserves and a collection of plants from the Nursery showing nursery methods of cultivation and propagation.

MEETINGS.

On January 4th, the Formers' Institute of Hawaii held its annual meeting in the Library room of the Board. Sessions were held in both afternoon and evening.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

INDEX FOR 1907.

An Index and Table of Contents for the last volume of the Forester is in the press and will accompany the February number.

BOARD OF AGRICULTURE AND FORESTRY.

DIVISION OF ENTOMOLOGY.

Honolulu, Hawaii, Jan. 15, 1908.

To the Hon. Board of
Agriculture and Forestry of Hawaii.

Gentlemen:—

I herewith make my report to you for the month of December, 1907.

During that month there arrived from outside the Territory twenty-nine steam and sailing vessels, seventeen of which had trees, plants, fruits, or vegetables, numbering 10,391 packages, as freight or mail.

When we found any infested with insects we treated them with chemical gas or fumes before delivering. Some small lots we destroyed.

The various lots came from the Orient, Europe and the Mainland.

On December 11th the S. S. "Moana" arrived from Sydney, Australia, having on board 360 large sacks of lupin seeds from Italy to be planted as green fertilizer. Upon inspection we found some of the seed to be infected with a coleopterous larva, so we had the entire shipment removed on the steam barge "Pioneer" to the fumigating chambers on the Channel Wharf, where we thoroughly fumigated them with carbon bisulphide.

Respectfully yours,

ALEXANDER CRAW,
Superintendent of Entomology and Inspector.

NEW PUBLICATIONS.

FARMERS' BULLETIN 312.

A Successful Southern Hay Farm, by Harman Benton, Assistant Agriculturist, Farm Management Investigation, Bureau of Plant Industry. Pp. 16.

This bulletin gives the details of the management, cultural methods, equipment and cost of a twenty-five acre hay farm in Cherokee County, South Carolina, with some general suggestions for hay growers in the South.

THE INTRODUCTION OF HONEY-PRODUCING PLANTS.

By D. L. Van Dine,

Secretary, Hawaiian Bee-Keepers' Association, Honolulu.

The source of our floral honey is, in the main, the flowers of algeroba. Our algeroba forests are, on the whole, well stocked with bees and although the bees do elaborate honey from the flowers of lantana, guava, oi, the ilimas, ohia, rice, pili, palm trees, citrus, and various ornamental trees, vines, and plants as well as certain weeds and shrubs, we must admit that our floral honey is limited in amount and in many instances this limit has already been reached. To increase greatly our production of floral honey we must introduce nectar-producing plants. Outside of the possibility of increasing the output of floral honey, the introduction of bee plants that will flower at a season when the algeroba is not in flow will prove of great importance to the bee-keeping interests. A bloom of even small amount preceding the algeroba flow would stimulate the brood, while plants that would yield nectar after the main flow has passed would mean that all of the crop could be extracted.

On my return from the trip to Washington in the interests of marketing Hawaiian honey, I spent some ten days in California investigating the honey-producing plants of that country with the idea of securing desirable plants for introduction into Hawaii. I arrived at Riverside from Southern Texas on June 1st and there met Mr. J. M. Rankin, Special Agent in Apiculture of the United States Department of Agriculture. In company with Mr. Rankin, who had spent over a year studying the bee plants of California, I covered the territory from Riverside to San Francisco and gained much information that I believe will prove of great value to the Hawaiian bee-keepers. I want to say that all expenses of the California work, with the exception of my own living expenses, were paid by the Office of Apiculture at Washington.

Following is a list of the principal bee plants of California:

The Sages (*Artemesia*)—black, white and button (purple). The black sage is the most important bee plant in California. The sages are all large yielders and are dry-land plants. The honey is white in color and mild in flavor.

Alfalfa (10 varieties).

Phacelia tancetifolia. Blooms during May and June. Common on waste, barren land. Good yielder and the best of the Phacelias. Gives a dark, highly flavored honey. *P. congesta,* observed only in rocky places. *P. parryi,* only a fair honey plant in Southern

California and yields nothing in the northern part of the State.

Melilotus alba (white sweet clover). A highly flavored honey. Plant readily eaten by stock on dry ranges. A large producer of honey and blooms all summer in California. *M. coerulea,* a European sweet clover. Blooms in June and July and is a fair honey plant. Not as readily eaten by stock as *M. alba.* *M. macrostachys,* a sweet clover with a white bloom, flowers from May to July, very good for both nectar and pollen, but requires fairly good soil. Mr. Rankin believes that this species of sweet clover would be more adapted to Hawaii than to California. *M. indicus,* a yellow sweet clover closely related to *M. coerulea.*

Trifolium tridentatum (clover). A good range plant in the California foothills, is a great sheep plant and a fine honey producer, does not require a great amount of soil, blooms during March and April. *T. variegatum* grows in moist places, a fine feed and a large honey producer, blooms during March, April and May. *T. depauperatum,* found in the foothills and valleys on the ranges, blooms in March and April. *T. albopurpureum,* yields only in bright weather, found in foothills and valleys, blooms in March and April.

Hosackia sp. (clover). A foothill, dry-land, grazing plant. Bees do not work on this plant in California, but Mr. Rankin believes it would be a good forage plant for our dry districts and would produce nectar under our conditions of climate.

Medicago denticulata (California burr-clover), a good bee plant found on the ranges, readily eaten by stock. *M. orbicularis,* a burr-clover that has no spines on the burrs, seeds as well as plant eaten by stock, is a fine bee plant and better than the California burr-clover.

Lupins (blue and yellow). Yellow found in sandy places, blue requires a good silt soil. Good bee plants.

Lipia repens (carpet grass, but not the California carpet grass.) A fine bee plant and readily eaten by sheep, hogs and poultry, used as a lawn plant in Southern California, stands tramping and is hard to eradicate, practically an arid plant, but water increases bloom, blooms from April to September.

Romneya coulteri (poppy), a weed in dry places. Excellent for pollen.

Manzanita (California shrub), grown 10 feet in height in barren places on mountains ,is an early honey producer and gives shade for sheep.

Lathyrus tingitanus (Tangier pea). A good forage plant and yields quite an amount of honey.

Erodium cicutarium and *E. moschatum* (Alfilaria or Filaree). Good bee plants in fertile soil and with moisture. Bloom from March to April.

Horehound. Widely distributed. Honey is amber in color and of decided horehound flavor. Seeds objectionable on sheep ranges.

Ulex europaeus (Gorse, yellow bloom). Prefers dry, sandy banks with sunny exposure. Sometimes used as a hedge plant. Good for early pollen.

Onobrychis sativa (sanfoin). One of the introduced crops of the Chico Station of the Department of Agriculture. Very succulent, not hardy to frost ,and promises well as a soiling crop and for green manure, but not suited for grazing purposes. A fair bee plant.

Onithopus sativus (serradella). See sanfoin.

Hedysarum coronarium (sulla clover). Same as two preceding plants.

Linden. Shade tree in northern climates. Good honey producers. Blooms in Northern California from May to July.

Rhamus californiacus (California coffee-berry. A very good bee plant. Grows in canyons in mountains and to some extent down in the foothills. Height 6 to 10 feet. Blooms during May.

Certain cultivated trees and plants that are not listed produce honey in California. The Citrus groves of Southern California produce a grade that is indeed "the nectar of the gods."

There are also many wild plants and weeds that are more or less important as bee plants, but it is not advisable to introduce them into Hawaii.

Of the above list of bee plants occurring in California, I am indebted to Mr. Jared G. Smith, for the following notes on those that are already established in Hawaii:

Alfalfa. Several varieties are cultivated in Hawaii.

Melilotus indicus. Now growing on the Parker and Molokai ranches. *M. officinalis* occurs on these ranches also.

Trifolium repens (white clover). Not listed in clovers occurring in California, but this species is found on the Haleakala and Makawao pastures. A valuable bee plant.

Medicago denticulata (California burr-clover). Introduced into Maui in 1882 by C. R. Blacow, now found on all the ranches of the islands.

Lupins (blue and yellow). Both are occasionally used as green manure plants on sugar plantations.

Lipia repens (carpet grass). Verbena family. Now growing at Hawaii Experiment Station.

Romneya coulteri (poppy). There is a horticultural form of this that is seen at times in gardens in Honolulu.

Lathyrus tingitanus (Tangier pea). This is now growing at Haiku, Maui.

Erodium ciccutarium and *E. mochatum* (Alfilaria or Filaree). These are now well established on upland pastures in Hawaii. They are also on Molokai. Seed introduced here in California hay.

Onobrychis sativa (sanfoin). This is one of the forage plants distributed to the members of the Hawaiian Stock Breeders' Association in 1904.

Onithopus sativus (serradella). This is established on Maui and Molokai.

Hedysarum coronarium (sulla clover). Now being grown on Haleakala and Parker ranches as a forage plant.

Seeds of the following plants have been received from Mr. J. M. Rankin for distribution to the members of the Hawaiian Bee-Keepers' Association and I await the pleasure of the Association in regard to their disposal:

Black sage.
White sage
Wild alfalfa.
Phacelia tancetifolia and *Phacelia* sp., a native California species.
Horehound.

Of the above the white sage and the black sage are the most important. Both Mr. Rankin and Mr. Jared G. Smith are of the opinion that the sages will not become a pest to our pastures or cultivated lands.

I include in this report a letter from Mr. Rankin in reference to seeds that have already been forwarded:

United States Repartment of Agriculture,
Bureau of Entomology,
Riverside, Cal., Oct. 19, 1907.

Mr. D. L. Van Dine,
Hawaii Agricultural Experiment Station,
Honolulu, T. H.

Dear Mr. Van Dine:

I am mailing you today seeds of the following California bee plants:

No. 1, Phacelia tancetifolia.
No. 2, Phacelia sp., a native of California, undetermined.
No. 3, White sage.
No. 4, Black sage.
No. 5, Horehound.
No. 6, Wild alfalfa.

I fully intended cleaning these seeds before I sent them to you, but time prevented me. They will, of course, grow if simply rubbed out and sown hulls and all.

As to the culture required by these plants I will state briefly:

No. 1 probably thrives best in good soil. It will form for you, I think, the most valuable plant of the lot as a bee plant. I do not know the range of conditions under which it will best thrive.

No. 2 grows in rocky waste land and is a dry-land plant. It also grows in the bottoms or wherever it can gain a foothold. This is a valuable plant for you, but not the nectar-producer that Phacelia tancetifolia has proved itself to be.

No. 3 grows on low elevations and thrives best in small sheltered canyons. It is a Southern California dry-land plant and is not found to any extent above 2500 feet. It thrives best at about 1000 feet.

No. 4, the black sage, grows all the way from San Francisco south at an elevation ranging from sea level to 3000 feet. It is by far the best honey plant native to California. It is a dry-land plant. The honey is white and mild.

No .5 is the most widely distributed honey plant in California. It is found from Siskyou to San Diego and from the sands of the beach to the snow line. From the nature of the seed you can see that it would not be a desirable plant on sheep ranges and it is possible that it is by the seeds sticking to the wool of the sheep that this plant has become scattered so widely. The roots are perennial and hardy. The nectar is amber and of good flavor with a decided horehound taste.

No. 6 is called the wild alfalfa. It is the only one of the lot that I am sending you that is of any value as a forage plant. It is eaten by sheep and cattle when other forage is scarce. It is found most abundantly in Southern California and in the San Jacinto Mountains. It thrives from sea level to 4000 feet, but furnishes the most nectar at about 2500 feet.

In addition to these seeds that I am sending you, I would suggest that you obtain the seed of Melilotus alba. It is a moist land plant, but good for both forage and nectar. Another plant which grows wild and abundant here is Hosackia, a legume, and a good forage plant. It yields no honey at all here, but I am confident that under different conditions it would yield nectar. I will send you a few roots of Lipia repens within a few weeks.

The seeds should all be sown at the beginning of the rainy season, if you have one, and I suggest that they be sown in plots so that if any undesirable plants should have accidentally been gathered they can be rooted out in the plot. Care was taken to keep out all foreign seed, but some may have crept in as I was not able to gather them all myself.

These are some of the principal honey plants of California and I anticipate that they will benefit you. I will be glad to do anything I can to assist you and the apicultural industry in Hawaii at any time.

Very truly yours,

(Signed) J. M. Rankin,
Special Agent in Apiculture.

AGRICULTURAL EXHIBITION.

In conjunction with the Hawaiian Poultry Association, the various agricultural institutions of the Territory held their second annual exhibition under the auspices of the Farmers' Institute of Hawaii, at the Drill Shed, January 8-11.

POULTRY EXHIBITION.

The display of poultry was arranged throughout the length of the room and showed a gratifying improvement over that of former years. All classes of birds were well represented.

HAWAII EXPERIMENT STATION.

A most interesting and instructive exhibition of the agricultural resources of the islands was shown by the local Experiment Station, and afforded, in a graphic manner, a striking proof of the field resources of the islands. Here raw rubber from Maui, manioc from Oahu, fodder grasses from Molokai, and tobacco from Hawaii, testified alike to the activities of the Station, and to the extensive development of our diversified industries which is now taking place.

BOARD OF FORESTRY.

The Division of Forestry displayed an instructive series of seedling trees and economic plants, illustrating various methods of planting and cultivation. Its exhibit of maps showing the forest reserves of the islands, together with its exhibition of the various apparatus relating to forest work, was also very interesting.

The Division of Entomology in its display of detrimental and beneficial insects afforded an opportunity of acquiring in a brief time much invaluable data relative to the economic insects of the islands. This department of the exhibition proved most instructive and was closely studied by many visitors.

The exhibition of the Division of Animal Industry also attracted much attention. It was arranged chiefly with a view to explain the various animal diseases which are proving a menace to stock in the islands. The display contained a series of organs of animals revealing the ravages of stock diseases.

GENERAL AGRICULTURAL EXHIBIT.

A fine series of island fruits and vegetables was displayed. Among these the bananas grown at Moanalua and by Mr. Booth,

and the Smooth Cayenne Pineapple were particularly noteworthy. The Spineless Cactus shown by Mr. G. P. Wilder attracted considerable attention. Although showing generally an improvement over the exhibition of last year, it is desirable that future years bring forth more response on the part of growers of vegetables and flowers. In the former of these sections much room for improvement was to be observed.

The following is the list of prizes awarded the agricultural exhibition:

PRIZES AWARDED AT SECOND ANNUAL AGRICULTURAL EXHIBITION OF THE FARMERS' INSTITUTE OF HAWAII.

Section A Fruits.

Class 1. Oranges, Seedling Hawaiian—First, C. W. Booth; second, Dr. Whitney, Honolulu. Navel—First, Mrs. John Soper, Honolulu; second, ex-Queen Liliuokalani. Mandarin—Second, C. W. Booth, Honolulu.

Class 2. Pomelos, Seedling Hawaiian—Second, H. J. Rhodes, Honolulu.

Class 3. Lemons—First, A. W. Carter, Honolulu.

Class 4. Limes—First, A. F. Judd, Honolulu; second, Harry Roberts, Honolulu.

Class 9. Papaias (long variety)—First, Mrs. John Soper, Honolulu.

Class 12. Bananas, Chinese (best single bunch)—First, Moanalua Gardens. Bluefields (best single bunch)—First, Moanalua Gardens. Ice Cream (best single bunch)—First, C. W. Booth.

Class 13. Pineapples, Smooth Cayenne—First, Hawaiian Pineapple Co.; second, Byron O. Clark.

Class 16. Best collection of rare or unusual fruits (not including any of the above varieties)—First prize, Harry Roberts; first, for Citrus Japonica, Mrs. J. Soper. First prize for coconuts, Moanalua Gardens.

Section B—Vegetables.

Best collection, first prize, Aliiolani College, Honolulu.
A new vegetable to Hawaii, Chayote, first prize, H. J. Rhodes.
Potatoes, first prize, Mr. McClean, Wahiawa, Oahu.

Section C—Vegetables.

Class 1. Grasses and legumes—First prize, Rhodes Grass, A. F. Judd; first prize, Paspalum dilatatum, A. F. Judd.

Class 2. Alfalfa green—First prize, John Cullens, Moanalua, Oahu, Moanalua Dairy. Alfalfa cured—First prize, John Cullens, Moanalua, Oahu, Moanalua Dairy.

Class 4. Fodder Corn—First prize, John McClean, Wahiawa, Oahu; second prize, John Cullens, Moanalua, Oahu.

Class 5. Field Beans and Peas (best collection)—First prize, Nippu Jiji Co., Honolulu.

Section D—Miscellaneous and Staple Crops and Products.

Coffee and its products, first prize, C. W. Booth.

Cassava and its products, first prize, C. Koelling, Kaneohe, Oahu.

Section E—Decorative Plants.

Class 1. Palms (best single specimen)—First prize, H. J. Rhodes. Best collection, first prize, H. J. Rhodes.

Section G—Cut Flowers.

Carnations (best 12 specimens of one variety)—First prize, Mrs. H. J. Rhodes; second, T. Kinikiyo.

Roses (best 12 specimens of one variety)—First prize, T. Kinikiyo, Honolulu.

Asters (best 12 specimens of one variety)—First prize, T. Kinikiyo, Honolulu.

Baumontia grandiflora and Ixora—First prize, C. W. Booth, Honolulu.

AWARDED HONORABLE MENTION BY THE JUDGES.

Boys' Industrial School, Waialee, Oahu, for general agricultural exhibit.

Pacific Guano and Fertilizer Company for exhibit of fertilizers.
Hawaiian Fertilizer Co. for fertilizer exhibit.
Hawaiian Fibre Company for sisal and its products.

Captain R. V. Woods, Kona Kanning Co., Kealakekua, Hawaii, for exhibit of jams and jellies, and vanilla beans.

Gerrit P. Wilder for spineless cactus.
Yamajo Soy Manufacturing Company for exhibits of Japanese sauces.

Hawaii Agricultural Experiment Station for general exhibit.

INFORMATION FOR INTENDING IMPORTERS OF LIVE STOCK FROM NEW ZEALAND

By G. C. Munro.

The importation of live stock for breeding purposes from New Zealand to Hawaii was stopped on the annexation of the latter country to the United States. The importation laws of the States coming into force, stock only was allowed entry at certain specified ports.

Finding the stock raisers of the Islands desirous of getting stock from New Zealand, Dr. Norgaard after considerable effort succeeded in obtaining permission for the importation of stock from that country to Honolulu. There are still some difficulties which, however, by care can be overcome. The principal of these is a duty of 27½% on all cattle not pure bred. Even if registered in the Herd book in New Zealand, unless such is recognized by the authorities in the United States, stock cannot pass the Customs without paying duty unless under special arrangement. As far as I know the New Zealand shorthorn Herd book is the only one now recognized.

It is necessary also to comply with the following regulations: A permit for shipment must be obtained from the United States Department of Agriculture to present to the Consul at port of embarkation, on production of which only can he give clearance papers for the shipment. This permit must be for a specified number and kind of stock and is only available between specified time limits. A similar permit is necessary for presentation at the port of destination to the Customs officer to admit of the stock being landed. A certificate from the local stock inspector where the stock is bought as to clean country and freedom from disease, an affidavit from the breeder also testifying to freedom from disease, another from the agent shipping the stock as to carriage through clean country, disinfection of cars used in carriage to port of shipment, and a copy of the pedigrees in special form must all accompany the stock, certified as entered by the custodian of the Herd book and sworn to by the breeder or agent as the identical animals described therein. The animals must also be subjected to the tuberculin test.

The best time of the year to ship stock from New Zealand is in December or January as then they are in good condition. The trip is generally a smooth one in these months. The bulls should be selected in October before the bull sales start. The sheep could be got at time of shipment if not later than January, as ram sales are held in February. The permits should be procured early and should arrive in New Zealand in about September or even earlier and should hold good from the middle of November

till the middle of February. Accompanying the permits should be the orders and letters of credit for purchase and expense. The agent can then go right ahead and select the stock, have them registered in the Herd book, arrange for their shipment and for the tuberculosis test. Even if already registered the pedigrees may have to be sent again to the editor of the Herd book to have them certified to in proper form.

There is only one steamship line (running bi-monthly trips) and generally leaving in the first week in the month, that is now available for carrying stock. The other lines are compelled to put on a prohibitive freight rate, so it will easily be seen that if the permits arrive in New Zealand after a part of the time limit has gone, the chance of getting the stock shipped is liable to be missed and much disappointment will result both to buyers, sellers and agent. This is exactly what has happened on two occasions this year. On the first occasion the time limit was for two months and the permits arrived close on the end of the first month. The other was for three months and arrived in the middle of the second month. In sending for permits ample time should therefore be allowed, as a few weeks unavoidable delay in the transmittal might make them useless on account of the sailing time of vessels. It would be better, if the Department would grant it, to have the time limit longer, and they should begin and end in the middle of the respective months.

A great variety of pure bred stock can be got in New Zealand and many of the stud flocks and herds are kept up to a high standard of breeding, changes being imported from England at high prices.

Arriving at Suva last May, by the courtesy of the Hon. A. W. Mahaffy, Colonial Secretary of Fiji, I was given a passage in the Government steamer Ranadi on her annual trip to refit in New Zealand. This brought me to Auckland in time for the winter show. By waiting for the regular steamer or going via Sydney I would have missed this exhibition.

Meeting some of the stock breeders there, I was introduced to the Hon. John D. Ritchie, Secretary of Agriculture, and Mr. E. Clifton, Chief Inspector of Stock. The need of the recognition in the United States of the New Zealand Herd and Flock books was brought to their notice, with the result that steps have since been taken to have this done, so that the 27½% of duty will be eliminated, if nothing is found to prevent the books being recognized. Prices vary greatly and it is not desirable to buy anything but first class stock, where so much has to be gone through to get the animals shipped.

There is nothing whatever now to prevent stock being imported from New Zealand if the permits and money are sent there in time, and the resolution complied with. Pure bred shorthorn cattle can be entered free of duty and the duty on sheep is light.

FARMERS' INSTITUTE.

The sixth annual meeting of the Farmers' Institute of Hawaii took place in the Library of the Territorial Board of Agriculture and Forestry on Saturday, January 4th.

At the afternoon session, in the absence of Mr. Jared G. Smith, Mr. William Weinrich presided. After the report of the Secretary, Mr. F. G. Krauss, the following officers were elected for the coming year:

President—Mr. W. T. Pope.
Vice-President—Mr. F. G. Krauss.
Secretary-Treasurer—Mr. William Weinrich, Jr.

The following new Board of Directors was elected: Messrs. R. S. Hosmer, P. L. Horne and J. G. Smith.

At the evening session, the following paper was presented by Mr. Jared G. Smith, the retiring president:

RELATION OF FARMERS' INSTITUTE TO EDUCATION.

The Farmers' Institute of Hawaii has been in existence six years. While it has perhaps not been a very live organization for that entire periol, it has lived, and has been one of the factors in helping to keep alive in this Territory a general public interest along the lines of agricultural education.

The Farmers' Institute is primarily an educational institution. Its growth on the mainland has been marvelous, so that now there is no state or territory which has not many of these organizations. In a larger share of the states the institution has been placed on as firm a basis as any other branch of the general educational system. The Farmers' Institute stands between the college and the people. Its function is to translate in the language of common speech the truths of scientific investigations as determined by the Experiment Station, and as taught by the Agricultural College. The colleges of agriculture, as now constituted, using the name "college" in the broader sense, embody three lines of work. These lines are not coördinate as separate entities, but are parts of the whole. The function of the Experiment Station is purely that of investigation to determine the scientific truths that underly the problems of life as related to agriculture. Such investigation is costly and slow. A very large equipment in men, and books and apparatus is required to enable an Experiment Station to successfully cover any one line of investigation; and only such lines can be attempted as the limitations of the Station's resources permit.

The function of the College of Agriculture and Mechanic Arts is to teach. The college must train young men and women, fitting them for the broader walks of life, making it possible for its

graduates to become better equipped for life's struggles by virtue of having the broader education which the college can confer upon them. The function of the college is never that of investigation, but is solely the training of men and women.

The Farmers' Institute stands in the same relation to men and women who have passed out of the schools into the practical work of earning a livelihood, as the college to its students, its function being to enable those whose schooling days are over to obtain at first hand the scientific instruction which will help them in their work. The Farmers' Institute is capable of almost indefinite extension, both as a college movement to reach those who can be benefited by the discussions which form a most important part of institute work; and downward, to improve conditions in relation to those who are directly upon the land. I have long seen the necessity for an organized movement to improve the agricultural and domestic conditions of the Hawaiian, Japanese and Portuguese farmers and laborers.

A statement has recently been made that not one farmer in fifty reads either Experiment Station Bulletins or the publications of the United States Department of Agriculture. What scientific facts in relation to their industry they become acquainted with, are strained through the agricultural journals of the land. It is undoubtedly true that greater good can often be accomplished by direct correspondence or by personal interviews. Personal interviews and personal correspondence becomes absolutely impossible when any large number of persons are to be instructed, so that direct personal dissemination of scientific truths becomes only practicable by lectures and public meetings held at convenient locations. I regret to say that even if farmers should read many of the scientific bulletins issued by the Experiment Stations, very little good would come of it, because of the unfortunate habit scientific men have of writing in a language of their own, not intelligible to the average man.

It is, therefore, a pleasure for me to turn over this Farmers' Institute work to the head of our new Agricultural College. The work is logically more closely related to that of college instruction than to that of investigation. Investigators, as a rule, are not satisfactory teachers. It requires a different temperament and an absolutely different training to make either a teacher or an investigator. The Farmers' Institute is in every way more intimately connected with college work than with station work; and I believe that only through close affiliation with the college and the college workers can the fullest and broadest development of Farmers' Institute work be realized.

The Hawaii Experiment Station is seven years old, the Farmers' Institute of Hawaii six, and I, for one, am gratified that the institution which will eventually grow to take in both of these organizations has at last been inaugurated. And I hope that there always will be the community of interest, the recognition

that each organization is complementary to the other in the scheme of general agricultural education in Hawaii.

At the conclusion of Mr. Smith's paper, Mr. W. T. Pope read an address on the College of Agriculture and Mechanic Arts, which forms the subject of a separate article, and is given elsewhere in this number.

In response to an enquiry as to the possibility of growing our own horse feed in the islands, Mr. Krauss reported that the Federal Experiment Station is investigating the merits of upland rice as a source of hay. Much satisfactory progress has been already made in this respect.

In advocating the desirability of growing our own feed, Mr. Jordan advanced the merits of corn as a horse ration in preference to barley. In Australia, corn was generally fed with good results and he believed that this feed would be as beneficial in Hawaii. He also advocated the judicious use of the algeroba bean.

Messrs. Hall, Weinrich and Krauss also spoke upon the various questions affecting the use of corn and the algeroba for feed in the islands. The general feeling of the meeting was that in view of the high price of stock feed which prevails in Honolulu an excellent opportunity exists of supplying the local market with home grown produce at a price below that which obtains at present.

The meeting, which had proved very interesting and enjoyable, adjourned at 9:30.

HAWAIIAN BLUEFIELDS.

Honolulu, Hawaii, Dec. 20, 1907.

Editor Advertiser: By steamship Alameda sailing from Honolulu, November 22nd, the Hawaii Experiment Station shipped to San Francisco three bunches of bananas of the Bluefields variety. These were shipped without wrapping, as is customary in handling this variety of bananas in the American trade. I have received from the consignee a report of the condition of the same, from which the following is extracted:

"By steamship Alameda I received the three bunches bananas O. K. One of the bunches was ripe and they were eaten up except three hands. The other two bunches had on a few ripe ones which had a very fine color, perfectly beautiful. The bananas were not bruised at all, but were just the same as when taken from the plants. I placed them in a very conspicuous part of the store and marked them so as everyone could see them. I am sure they will turn a fine color and would be very profitable if raised down there for this market. They have a much better flavor than the eastern bananas."

It is gratifying to learn that these fruits arrived without bruising. The fact that they were ripe is due to their being too far matured before shipping. Had they been gathered a week earlier they would doubtless have arrived green.

Yours truly,

JARED G. SMITH,
Special Agent in Charge.

BOARD OF COMMISSIONS OF AGRICULTURE AND FORESTRY.

DIVISION OF ANIMAL INDUSTRY.

RULE 5—TO AMEND RULE 1 AND TO REVOKE RULES 2 AND 4 OF THE DIVISION OF ANIMAL INDUSTRY GOVERNING THE INSPECTION AND TESTING OF LIVE STOCK INTENDED FOR SHIPMENT TO THIS TERRITORY.

Rule 1 of the Division of Animal Industry is hereby amended by striking out paragraph 4 which reads—"Until further notice the ports of Honolulu, Oahu, and Hilo, Hawaii, shall constitute the only ports of entry for live stock and other animals for this Territory."

Rules 2 and 4 of the Division of Animal Industry are herewith revoked, their place being taken by Rule 6.

This rule shall take effect from and after the date of its approval.

Approved December 31, 1907.

RULE 6—INSPECTION AND TESTING FOR GLANDERS AND TUBERCULOSIS OF LIVE STOCK INTENDED FOR IMPORTATION.

In order to prevent the further introduction of glanders and farcy into this Territory, it is hereby ordered that:

No horse stock, (including mules and asses), shall be admitted to the Territory unless accompanied by a certificate of health showing that the animal or animals in question have been submitted to the mallein test and found to be free from glanders. Said test must be made and certificate issued by a veterinarian authorized by the United States Bureau of Animal Industry, and endorsed by the Bureau Inspector in Charge at the port of shipment.

Any person contemplating the importation of horse stock to this Territory shall notify the Territorial Veterinarian, his assistant or the local Livestock Inspector of the approximate time of arrival of such stock, the name and address of the consignee, the name of the vessel and the port of entry.

Upon arrival of the stock the Territorial Veterinarian or his local representative shall be notified at once and the stock held as directed in Rule 1 until the same and the accompanying papers have been examined by him and a permit of landing issued.

In order to prevent the further introduction of tuberculosis in cattle it is hereby ordered, that:

No cattle above the age of six months shall be admitted to the Territory unless accompanied by a certificate of health showing that the animal or animals have been submitted to the tuberculin test and found to be free from tuberculosis. The said test must be made and certificate issued in the same manner and by the same authorities as prescribed for the importation of horse stock, and the same general rules governing the latter shall apply to the importation of cattle.

In case horse stock or cattle should be landed at a port of entry where no local representative of the Division of Animal Industry is stationed and where it would be impossible for him to reach within a reasonable time after the arrival of the stock the owner or consignee shall be allowed to remove the animals to convenient premises where care can be taken of them and where they can be kept isolated from other stock of the same kind, upon the following conditions:

The owner or consignee shall without delay notify the Territorial Veterinarian, or his nearest representative, by telephone, wireless or otherwise of the arrival of the stock and the place where he has taken them to. If so directed he shall forward the papers accompanying the stock for examination by the Territorial Veterinarian or his representative.

Until the arrival of either of these officials or until he receives notification that the accompanying papers are satisfactory, the owner or consignee shall consider the animals quarantined,—that is they shall be kept in a stable or enclosure where no other animals of their kind are kept and where they cannot come in contact, direct or indirect, with any such animals.

Special care should be taken that the imported animals are not watered where other stock drink, but that a separate watering place is provided or the animals watered with a bucket used for no other purpose.

No animal shall leave the stable or enclosure until officially admitted to the Territory.

If any horse stock shall be found by the Territorial Veterinarian or his representative upon arrival in the Territory, to be infected with glanders or any cattle to be infected with tuberculosis, the same shall be immediately destroyed and the carcass disposed of at the expense of the owner, under the supervision of the Territorial Veterinarian or his representative.

Any violation of this regulation is a misdemeanor, and punishable by a fine not to exceed $500 (See Sec. 390, Chapter 28, Revised Laws, 1905, and amendment thereto, Sec. 3, Act 82, Session Laws, 1905, and Act 112, Session Laws of 1907).

This rule shall take effect from and after the date of its approval.

Approved December 31, 1907.

RULE 7—INSPECTION OF SHEEP AND SWINE INTENDED FOR IMPORTATION.

In order to prevent the further introduction into this Territory of the diseases known as sheep scab, hog cholera and swine plague it is hereby ordered that:

No sheep shall be admitted to this Territory unless accompanied by a certificate of health issued or approved by an officer of the United States Bureau of Animal Industry, and to the special effect that the animals are free from sheep scab or have been dipped in accordance with the regulations of the United States Bureau of Animal Industry and under the supervision of an officer of the said Bureau, and

No swine shall be admitted to this Territory unless accompanied by a certificate from the same authorities to the effect that the animals have passed a careful veterinary inspection, and are free from any indication of disease, especially hog cholera and swine plague, and that so far as has been possible to ascertain no contagious disease has existed in the district whence they came.

Any violation of this regulation is a misdemeanor, and punishable by a fine not to exceed $500 (See Sec. 390, Chapter 28, Revised Laws, 1905, and amendment thereto, Sec. 3, Act 82, Session Laws, 1905, and Act 112, Session Laws of 1907).

This rule shall take effect from and after the date of its approval.

(Signed) C. S. HOLLOWAY,
President and Executive Officer Board of Commissioners of Agriculture and Forestry.

Approved December 31, 1907.

(Signed) E. A. MOTT-SMITH,
Acting Governor.

ARTIFICIAL RUBBER.

The synthetic preparation of rubber is generally believed by those who appreciate the extreme complexity of the compounds elaborated by nature, to be as far distant as the manufacture of artificial sugar. In view of the present uneasiness on this subject which has been expressed by Hawaiian growers, we would direct them to the following expression by the Consulting Engineer of the New Gutta Percha Company, copied from the Daily Mail (London):

"I have been approached on numerous occasions with samples of all sorts and descriptions of synthetic rubbers and so-called substitutes, some of which I have been led to subject to long-continued and exhaustive tests, the results of which, however, have only served to demonstrate the uselessness as substitutes for pure rubber or for the rubber compound owned by the company for whom I act I had the privilege, during the lifetime of Dr. Carl Otto Weber, of going exhaustively into the question of synthetic rubber with him, and the views he expressed to me on the possibility of producing rubber artificially by synthesis were decidedly and unequivocally adverse."

KOOLAU RAILWAY.

Eleven miles of the Koolau railroad, connecting with the Oahu line at Kahuku, will be completed by the end of this year. Already the extension is having a most stimulating effect on the agricultural development of that side of the island. Cotton, rubber and copra production are alike being projected by companies and individual settlers. A factory for the manufacture of manioca starch is in operation. Pineapple planting is projected on an extensive scale and canneries for that fruit will soon be established. Other things which grow well in the section are citrus fruits, peanuts, vanilla beans, soy beans and kitchen garden products generally.

THE HAWAIIAN

FORESTER AND AGRICULTURIST

VOL. V FEBRUARY, 1908 No. 2

COLLEGE OF AGRICULTURE—EVENING COURSE.

The College of Agriculture and Mechanic Arts has arranged a course of evening lessons for which there are no requirements other than interest and good attention.

This agricultural course includes such subjects as botany, soils, entomology, horticulture, fertilizers, plant breeding, farm crops, forestry and a comprehensive lecture on general agricultural literature.

Following is a synopsis of the course:

EVENING COURSE IN AGRICULTURE.

Evening of the Month.	No. of Lessons.	Time of Evenig	Subject Studied.	Instructors.
Feb. 18	1	7:30 to 9:00	Soils	W. T. Pope
	2	9:00 to 10:00	Botany	Jared G. Smith
Feb. 21	3	7:30 to 8:30	Soils	W. T. Pope
	4	8:30 to 9:30	Botany	Jared G. Smith
Feb. 25	5	7:30 to 8:30	Entomology	D. L. Van Dine
	6	8:30 to 9:30	Botany	Jared G. Smith
Feb. 28	7	7:30 to 8:30	Entomology	D. L. Van Dine
	8	8:30 to 9:30	Botany	Jared G. Smith
Mar. 3	9	7:30 to 8:30	Entomology	D. L. Van Dine
	10	8:30 to 9:30	Horticulture	J. E. Higgins
Mar. 6	11	7:30 to 8:30	Entomology	D. L. Van Dine
	12	8:30 to 9:30	Horticulture	W. T. Pope
Mar. 10	13	7:30 to 8:30	Artificial Fertilizers	F. G. Krauss
	14	8:30 to 9:30	Horticulture	J. E. Higgins
Mar. 13	15	7:30 to 8:30	Plant Breeding	F. G. Krauss
	16	8:30 to 9:30	Horticulture	W. T. Pope
Mar. 17	17	7:30 to 8:30	Entomology	J. Kotinsky
	18	8:30 to 9:30	Horticulture	J. E. Higgins
Mar. 20	19	7:30 to 8:30	Entomology	J. Kotinsky
	20	8:30 to 9:30	Horticulture	J. E. Higgins

Mar. 24	21	7:30 to 8:30	Farm Crops	F. G. Krauss
	22	8:30 to 9:30	Horticulture	W. T. Pope
Mar. 27	23	7:30 to 8:30	Forestry	R. S. Hosmer
	24	8:30 to 9:30	Horticulture	J. E. Higgins
Mar. 31	25	7:30 to 8:30	Forestry	R. S. Hosmer
	26	8:30 to 10:00	Agricultural Literature	Jared G. Smith

BRIEF OUTLINE OF SUBJECTS OF EVENING COURSE.

Botany—

1st Lesson—Vegetable Cell; Structure, Growth, Contents, etc.

2nd Lesson—(a) Organs of Vegetation. Root, Stem and Leaf.
(b) Process of assimilation and growth.

3rd Lesson—Flower. Plan, Organs, etc.

4th Lesson—(a) Fertilization in Flowers.
(b) Fruits, Nature, Kind, etc.

Economic Entomology—

1st Lesson—Place of Insects in Animal Kingdom. Characteristic, etc.

2nd Lesson—Life History and Development. Metamorphosis.

THE TEMPORARY COLLEGE OF AGRICULTURE AND MECHANIC ARTS, OPPOSITE THOMAS SQUARE.

3rd Lesson—Injurious Insects and their Control, etc.
4th Lesson—Hawaiian Entomology.
5th Lesson—Scale Insects.
Distribution in World and Origin in Hawaii.
6th Lesson—Beneficial Insects—Direct and indirect.

Horticulture—

1st Lesson—General Survey of Hawaiian Fruits.
2nd Lesson—Germination of Tree Seeds and Growth of Seedlings.
3rd Lesson—Care and Cultivation of Fruits in general.
4th Lesson—(a) Propagation of Plants.
(b) Budding, Grafting and Pruning.
5th Lesson—Culture of Citrus Fruits in Hawaii.
6th Lesson—Ornamental Shrubbery of Hawaii.
7th Lesson—Culture and Study of Varieties—
Banana, Avocado, Mango and Papaias.
8th Lesson—Marketing of Hawaiian Fruits.
Picking, packing and shipping. ,

Soils—

1st Lesson—Origin, Properties, Plant-food, etc.
2nd Lesson—Classification, Tillage, Drainage, etc.

Artificial Fertilizers—

1st Lesson—Chemical Constituents, Values, etc.

Plant Breeding—

1st Lesson—Production, New Varieties.

Farm Crops—

1st Lesson—Farm Crops for Hawaii.

Forestry—Taken up in two lessons.

1st Lesson—Forestry in General.
2nd Lesson—Hawaiian Forestry.

Mr. Jared G. Smith will give a summary of literature on general agricultural information. Where it can be obtained and how to make use of it.

The short course of evening lessons for the public begins February 18th, including two lessons per evening, closing March 31.

Tuesday and Friday evenings have been selected as evenings probably most suitable to those desiring to take up the work.

The instructors will use specimen and stereopticon views to illustrate lessons.

Persons desiring to take up the work should notify the Dean of the College as early as possible.

The College of Agriculture and Mechanic Arts, established by the Territory of Hawaii and subject to the endowment of the Federal Government, affords a substantial education to both young men and women.

In September this institution will present courses in Agriculture, Civil Engineering, Electrical Engineering, Mechanical Engineering and Domestic Science, which lead to the degree of Bachelor of Science.

Special courses, not leading to a degree, can be arranged for.

Instruction will be given by the use of text-books, by lectures and recitations; also by practice in field, laboratory and drawing room. Throughout the courses theory and practice go hand in hand.

For information address,

PROF. WILLIS L. POPE,
Acting Dean.

Honolulu, Territory of Hawaii.

THE POULTRY INDUSTRY.

The workers engaged in the rapidly expanding poultry industry of Hawaii are materially contributing to the industrial development of the islands. Together with the promoters of other and often more conspicuous agricultural enterprises, the breeders of poultry are assisting in making the Territory independent of the products of other countries. The growing popularity of chicken breeding, and the great interest which is being shown in the industry, are some of the minor but none the less important evidences of the progress which is taking place in the extension of our diversified industries.

JAPAN AND CAMPHOR.

That the Japanese are bestirring themselves to maintain their position in controlling the camphor industry is evidenced by a recent speech of the Minister of Finance which is referred to in another part of this issue. The extraordinary manner in which the uses for this valuable product have increased in recent years is only commensurate with the expansion of the application of rubber in the arts and manufactures. Many countries are looking to the production of camphor as a profitable source of investment, and the suitability of these islands to the growth of the tree renders it advisable to experiment in this direction upon land which is not favorable for the planting of established island crops.

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

DIVISION OF FORESTRY.

ROUTINE REPORTS.

Honolulu, Hawaii, Feb. 12, 1908.

Board of Commissioners of Agriculture and Forestry,
Honolulu, Hawaii.

Gentlemen: I have the honor to submit the following report of the Division of Forestry for the period from January 8th to date.

During the second and third weeks of January I was busy in Honolulu with the preparation of reports having to do with forest matters in the District of Kona on Hawaii and proposed Forest Reserves on the islands of Maui and Hawaii.

On January 24th, pursuant to a resolution passed by the Board at the meeting held on January 15, I made a ten days' trip to the District of Hamakua on the Island of Hawaii, to further investigate the forest situation there and to obtain further information on certain problems. A full report containing my findings will be submitted to the Board later. I was accompanied on this trip by Mr. F. D. Creedon, late private secretary to Hon. G. R. Carter, who acted as official stenographer and took down the statements of the persons interviewed along the way. I returned to Honolulu on February 6, since which date I have been busy with the preparation of my report on the trip.

ADVICE AND ASSISTANCE.

At the request of the Kohala Sugar Company, Mr. Haughs left on February 11 for a four days' trip to the District of Kohala on the Island of Hawaii to prepare a planting plan for certain lots in the Awini Homestead tract, now owned by the Kohala Sugar Company, on which they desire to plant trees.

ROUTINE MATTERS.

On February 5 there was received from the Honorable J. K. Kalanianaole, Delegate to Congress, a collection of vegetable and flower seeds, being a portion of his quota of the free Congressional seed. Arrangements have been made with the Department of Public Instruction whereby the greater part

of this seed will be distributed through the schools. What remains will be given out to those who may apply for the same.

During the past three weeks certain improvements have been made in the office building at the Nursery, consisting in the re-arrangement of the windows in several of the offices so that more light and air can be secured. A new seed testing house is also being erected in the Nursery to facilitate the experimental planting of exotic and other seeds received by this Division.

The improvement of the Nursery grounds goes on slowly but steadily, the portion of the grounds nearest the building having now been got into presentable shape.

A number of new books have recently been received by the general library and by each of the Divisions. The work of preparing a card catalogue of the library is also progressing.

MEETINGS.

The Honolulu Improvement Advisory Board met in the Library room of the Board on January 8; the Hawaiian Poultry Association on January 14 and February 11, 1908; and the Kaimuki, Palolo and Waialae Improvement Club on February 10, 1908.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

The Ceylon Tropical Agriculturist for October last contains much instructive advice relative to the frequency of tapping rubber trees. The chief questions which the rubber producer is asking are: How soon can the renewed bark be tapped as vigorously as the first bark, how well does it yield, how soon can the second renewed bark be tapped? The present system of tapping now in vogue has also to be investigated in order to determine whether it is, all things considered, the most beneficial. So far as is known the renewed bark is little use under two years, so that the first tapping must be made to last as long as that time at least, whether by tapping on one side of the tree only, by allowing periods of rest or by tapping first at the bottom and then above. A careful study of the article referred to is recommended to Hawaiian growers. Among suggested experiments which planters should themselves try and that give good results, are tapping to left and right respectively, tapping in big V's at the base, and tapping renewed bark at different ages.

EXTRACTS FROM THE REPORT OF THE GOVERNOR OF HAWAII FOR THE YEAR 1906-07.

In the report of the Governor of Hawaii for the fiscal year ending June 30, 1907, the last report to be issued by Honorable George R. Carter, there appears a section entitled "Work of the Board of Agriculture and Forestry," made up of contributions prepared by the three Chiefs of Division, Messrs. Craw, Norgaard and Hosmer. As the report is only issued in a limited edition, these statements are re-published in full on another page of this issue for the information of those interested.

Elsewhere in the report Mr. Carter makes definite recommendations in regard to forest matters and agricultural problems in the Territory. These paragraphs are as follows:

"During the fiscal year forest reserves to the extent of 147,-715 acres have been set aside by proclamation, the total area of the forest reserves now being 397,187 acres. The value of a forest belt to the productive wealth of any area is becoming more and more apparent as the connection between the forest-covered area and the water supply is better understood."

* * * * * * *

"The most important legislation needed for Hawaii is negative in its nature, i. e., to exempt her from the application of laws absolutely unfitted for her unique conditions. Hawaii's problems are not those of the mainland or of the other Territories. While Hawaii is an integral part of the Union, its geographical location, people, and crops are radically different from those of the mainland. The application of a number of the general laws of the United States seriously retards progress now, and others might unwittingly bring about a crisis.

"On the other hand, much has been and can be done by Congress to encourage the progress that is being made toward building here a community homogeneous with those on the mainland. However, laws will not change the period in which crops mature and can not make the crops here similar to those in the Temperate Zone. And yet, in the administration of our public lands, the limit of time beyond which the lands can not be leased is based on the practice in the Temperate Zone. Many tropical crops can not be produced within the five years prescribed.

"Including these islands as a part of the Union does not bring them nearer to the continent; they are still 2,100 miles away. Nevertheless they are regarded as forming a part of the coast line and the coastwise laws are applied to Hawaii, notwithstanding that travel between here and the mainland is confined exclusively to water, while on every other portion of the coast there is transportation by land as well as by water.

The result of this law is that after seven years' application American steamers are withdrawn from the service, owing to their inability, in spite of all the protection, to earn returns upon the capital invested. The service between this port and the mainland is rapidly retrograding. Steamers flying a foreign flag and taking only the mails continue to make a profit and touch here constantly on their way to and from the mainland, although deprived of any passenger or freight traffic. Free communication between these islands and the mainland in every available manner is essential to commerce and trade and will be one of the principal means to prevent Hawaii from becoming in any way alien in disposition or composition.

"Another illustration in point is the application of the pure-food law, under which honey that polarizes to the right is held to be an adulterated article. There is an aphis in Hawaii that abstracts juice from the leaf of the sugar cane, and the bees, unable to accomplish any such results, steal from the aphis the product of its labor. Thus much of the Hawaiian honey (not by any means all) when taken from the hive and out of the comb—made by the bees themselves—will polarize to the right and is therefore classified as an 'adulterated article.'"

* * * * * * *

"In the field of positive legislation the greatest needs are sufficient appropriations for the Federal Departments in Washington.

"The supply of water should be measured. The United States Geological Survey is willing to aid, but its funds are restricted and already allotted.

"We need effective assistance in forest work. The Forest Service supplies experts to assist private individuals and corporations on the mainland ready and willing to devote the necessary amount of money to this work. But Hawaii, although paying her full quota to the Government, is too far removed for the limited resources of the Forest Service, and yet in no part of the United States is this work of greater importance."

* * * * * * *

"Efforts have been made to induce the proper Federal service, in coöperation with the Territory, to take up the question of a survey of the water sources of Hawaii, both above and beneath the surface.

"In islands like these, water limits the production of wealth. Practically all the low level land to which water can be taken by gravity is in use. To increase population and production water must be conserved, its waste avoided, and its most economical application provided for. The most intelligent use of the land and a wise land policy can only result from the study of correct data, and thus the assistance of the scientific departments of the Federal Government will prove one of the greatest benefits arising from annexation.

"If the water is measured now the real value of forest reserves can be accurately determined and demonstrated in the future, while otherwise it will remain largely a matter of opinion.

"No private enterprise will undertake any such work in connection with Government or common property unless there is an opportunity to profit by superior knowledge of actual conditions, and officials held responsible should not be expected to act without proper information.

"No work in Hawaii is of more importance than this question of a water survey. The extent of our future population depends upon the amount of water, and yet we are in absolute ignorance of its total volume, and can only venture a guess as to whether it is increasing, rapidly diminishing, or remaining constant.

* * * * * * *

By act 24 of the legislative session of 1907 was established the College of Agriculture and Mechanic Arts of the Territory of Hawaii. The college is under the control of a board of five regents, appointed by the governor for the term of four years, with the exception of the first incumbents. The purposes of the college, as set forth in the act creating it, are—

"To give thorough instruction in agriculture, mechanic arts, and the natural sciences connected therewith, and such instruction in other branches of advanced learning as the board of regents may from time to time prescribe, and to give such military instruction as the Federal Government may require. The standard of instruction in each course shall be equal to that given and required by similar colleges on the mainland, and upon the successful completion of the prescribed course the board of regents are authorized to confer a corresponding degree upon all students who shall become entitled thereto."

The legislature appropriated, from the loan fund, $10,000 for the erection of buildings, purchase of apparatus, fixtures, etc., and $15,000 from the general revenues of the Territory, $10,000 of which is to be for salaries and $5,000 for general expenses.

The board of regents has been appointed and the task of selecting a site and putting the institution in working order is already under way. Much interest has been manifested by the community in the college, and it is hoped that many good results will flow from it. With the aid that this institution should receive from the Federal Government, under its munificent system of endowing agricultural colleges, a most thorough system of practical instruction can be built up, the equal of any that obtains in our sister Territories. This being a subtropical country, the problems that will be presented here will be unique, and their working out will be watched with much interest.

WORK OF BOARD OF AGRICULTURE AND FORESTRY.

[From the Report of the Governor of Hawaii for the Year 1906-07.]

ENTOMOLOGICAL WORK.

A marked result of organized entomologcial work has been the introduction, propagation, and distribution of beneficial insects, carried on by the joint effort and expense of the Hawaiian Sugar Planters' Association and the Territorial board of agriculture and forestry.

Until within the past few years, plants, trees, fruit, and seeds from all parts of the world, accompanied by their insect pests and diseases, came into Hawaii without objection or hindrance, either by inspection or fumigation, with the result that all the pests now infesting crops, wild growth, and forest trees were introduced into a country that was congenial to their propagation and spread. The same country that has favored the destructive pests has also been favorable for the increase of the beneficial species that have been introduced to prey upon the pests.

It is a well known fact that such insects as live on other species seldom attack any vegetable growth of fruit, no matter how hungry they may be. The beneficial effects of the introduction, nearly three years ago, of insects that live on parasites, have surpassed the most sanguine expectations. In three years the loss to the sugar planters of this Territory from the "cane leaf hopper" *(Perkinsiella saccharicida)* has been reduced from $3,000,000 to practically nil, and plantations that were to a certain extent abandoned are again producing heavy crops of sugar, because the parasites have checked the leaf hoppers by destroying the eggs of that pest. This never could have been accomplished by artificial remedies.

Not only has the cane leaf hopper been subdued in the sugarcane plantations, but the "buffalo leaf hopper," which was such a destructive pest upon coffee and other economic trees, has been greatly checked in numbers. To show that this method of warfare is not confined entirely to insects inhabiting trees and plants, I have but to call your attention to the evident good work of a very minute imported hymenopterous parasite *(Eucoila impatiens)* that is doing good work in reducing the numbers of the stock pest called the "horn fly." This parasite has been widely distributed on the islands. The two previously mentioned species attack the eggs of the pests, whereas the "horn fly" enemy attacks the maggots and pupæ in the cow dung. Besides distributing colonies of these parasites in pastures infested with "horn fly," we also breed them and other

parasites in the laboratories and send them by mail in safety to all districts. In this manner it has been possible to widely extend their distribution.

Besides fighting the existing pests in the only sensible and effective method, we still guard our Territory against new or fresh importations. Every vessel arriving from outside the Territory is boarded and its manifest examined, and everything of a vegetable nature is inspected, and if found infested is fumigated or destroyed.

Various importations of sugar cane attacked by diseases unknown in our Hawaiian sugar plantations have been intercepted and destroyed. Those came from Formosa, China, the Philippine Islands, and Florida. Other plants and seeds have been held up and destroyed or deported. Two importations, each of 200 crates of potatoes from Australia, in April last, were found to be very seriously infested with the larvæ of the "potato tuber moth" *(Lita solanella)*. Hardly an inch of the potatoes was free from the effects of the caterpillars' work. Each shipment was placed on board again, taken out one day's sail to sea, and dumped overboard, crates and all.

During the season of 1906, 22,924 sacks of infested Japanese rice were fumigated with carbon bisulphide. The agents of the steamships plying between Central America and the Hawaiian Islands have been cautioned against accepting citrus fruits as freight or allowing any of the crew or passengers from bringing such fruit from Salina Cruz or other ports in Central America.

ANIMAL INDUSTRY.

The division of animal industry began its operations on July 1, 1905.

Every incoming steamer carrying live stock is met by the Territorial veterinarian or a local live-stock inspector, and no stock is allowed to be landed until a certificate of health has been issued. The former custom of collecting a fee for each animal inspected was completely abolished. The most important feature of this new system of inspection is, however, the insisting upon the mallein test for all horse stock and the tuberculin test for all cattle imported. The great prevalence of glanders in certain districts of the Territory is undoubtedly due to continued importations of diseased animals, especially mules from California. In three instances, during the past two years, have shipments of mules arrived in Honolulu with glanders among them, and only for the compulsory mallein test and vigilance on the part of the inspectors inestimable loss might have resulted. The tests of all cattle, whether dairy cows or breeding stock, for tuberculosis have prevented the introduction of a number of affected animals.

By the appointment of an authorized inspector in San Francisco facilities have been provided for the testing of all such

animals before shipment to this Territory, and arrangement has been made for the inspection of all stock before leaving San Francisco by officers of the United States Bureau of Animal Industry.

While every effort has been made to prevent the further introduction of glanders from abroad, the fight against the disease within our borders has been carried on unremittingly. More than one hundred animals affected with glanders have been killed, and whenever possible every animal exposed or suspected has been mallein tested or quarantined indefinitely. In this work the division has had the support of the local practicing veterinarians, but the large percentage of oriental horse owners makes it an exceedingly difficult problem to disseminate knowledge regarding the dangerous nature of the disease or to enforce rules and regulations compelling coöperation in its eradication. By continued efforts along these lines the prevalence of the disease will gradually diminish even though there is little prospect of its complete eradication until the Territory can see its way to pay an indemnity for animals destroyed.

The superintendent of the division of animal industry, having made a survey of the principal islands of the group, came to the conclusion that the apparent reason why this Territory has been unable to supply the local demand for all classes of live stock is due to a more or less pronounced deficiency in mineral matter, especially phosphate of lime in the soil, and subsequently in the forage grown here. As these lime salts are absolutely essential to the growth of bone, their absence or deficiency interferes with the development of the young animals and causes a serious disease in grown animals. As a result the young animals develop slowly and in certain sections many of them die.

Experiments have been conducted for the past two years for the purpose of ameliorating this condition and the present outlook is that the lacking lime salts can be supplied economically and efficiently both to the animals on the range and in the paddocks. The lime salts are supplied in the form of a lick, a mixture of bone meal and molasses, or bone meal and salt, and placed in troughs near the watering places. Where this treatment has been carried out on a large scale the effect has been surprising. The mortality has stopped completely, while the young animals develop normally and show a much more rapid growth. Calves which have had access to this mixture from the time of birth show nearly twice as much bone as those from ranges deficient in lime salt and where no treatment has been applied.

Other diseases which have had the attention of this division are sheep scab and the dipterous parasites, such as the horn fly and the screw-worm fly. Dipping vats have been installed

in several places and the disease either checked or eradicated, while experiments have been made with many remedies for the fly pests.

Heartworm disease in dogs, hematuria in cattle, osteoporosis in horses, as well as a number of intestinal parasitic diseases, have come under observation and will be thoroughly investigated as soon as the new laboratory, for which the last legislature provided, has been erected.

One of the main efforts of this division has been in the line of improvement of the live stock through importation of pure-bred stock from the mainland or from New Zealand. Through special permit from the United States Department of Agriculture a trial shipment of pure-bred stock from New Zealand has been authorized. In this importation, which will consist of 22 selected bulls and 95 rams, thirteen different ranches will participate. At the same time a large number of pure-bred bulls and rams have arrived or will arrive from the States.

The division of animal industry has, during the first two years of its existence, been considerably handicapped for lack of funds, but the last legislature showed its appreciation of what had been accomplished by a liberal appropriation for working expenses as well as for the establishment of a pathological laboratory for the investigation of diseases of live stock.

FOREST WORK.

Forest work as a branch of the Territorial government has now come to have a recognized place in Hawaii. Appropriations by successive legislatures, the enactment of comprehensive forest laws, and the steady growth of public sentiment are self-evident proofs of this assertion. The underlying reasons are not far to seek. In Hawaii the intimate relations between a protected forest cover and regulated stream flow are apparent and well understood. Hence it is but natural that forestry should play the important part that it does in the internal economy of the Territory.

The forest work of Hawaii falls under two main heads, (1) the creation and maintenance of forest reserves—essentially "protection forests" on the important watersheds—and (2) forest extension—the planting of waste and barren areas with useful trees, and the introduction of exotic trees and shrubs of value to the Territory. The creation of forest reserves holds first place in the activities of the division, but the work in forest extension is steadily progressing in interest and importance.

For the fiscal year ending June 30, 1907, a number of substantial gains are to be recorded in Hawaii's forest work. Among them are: (1) The creation of five new forest reserves with a total area of 147,715 acres, of which 120,926 acres are

government land. This brings the number of established forest reserves up to a total of 13 and the aggregate total area to 397,187 acres. The new reserves are in the districts of Kau on Hawaii, Hana on Maui, Waianae on Oahu, and Kona and Na Pali on Kauai. (2) The completion of the field work leading to the creation of three other reserves on Maui and Oahu, which together will have a total area of approximately 52,500 acres. (3) The ratification of an agreement between the government and the Alexander and Baldwin plantations, on Maui, whereby the management of a large area of privately owned land, in one of the Maui forest reserves, is turned over to the government. This action is an important step and marks the beginning of a closer coöperation between the government and the large private interests directly benefited by the forest reserves. (4) The increasing number of applications received from corporations and individuals for advice and assistance in tree planting. Under an offer of coöperation the division of forestry sends an agent to examine the locality proposed to be planted. This agent draws up a plan of work and gives comprehensive directions of what, where, and how to plant in order to obtain the desired results. The response to this offer during the past year shows that the subject of providing for a future wood supply is becoming a vital question in many parts of the Territory and one that is attracting the attention of men of foresight. (5) The enactment by the legislature of 1907 of two amendments to the forest law of 1903, which simplify and strengthen that act. Under this same head may also be mentioned the appropriations for the coming biennial fiscal period, which provide for the continuation by the Territory of its forest work. (6) Outside of the forest work carried on by the Territory itself, mention should be made of the progress during the past year toward the commercial utilization of koa and ohia lehua. Owing to unavoidable delays in getting the machinery for its mill the Hawaiian Mahogany Lumber Company has not yet been able to put much koa on the mainland market, but the delay has led to the development of what promises to become an important industry, the logging of ohia for railroad ties. A shipment of over 13,000 ties was sent to California in June, and locally there is an increasing demand for ohia, both for ties and for piling. (7) In the somewhat allied field of rubber production experiments in tapping the groves of Ceara rubber trees on Kauai indicate that sufficient latex can be obtained to insure the success of the industry and make it highly profitable.

Another departure that promises one day to become an industry of some importance is the establishment in different parts of the Territory of several cocoanut groves for the production of copra and perhaps also of coir.

Altogether the past year has been one of decided progress in

forestry in Hawaii, for if the accomplishments are not of a spectacular order they are nevertheless real and substantial gains toward a more complete control and utilization of the natural resources of the Territory.

AREA OF FOREST RESERVES

No.	Name	District	Island	Total Area Recommended to be Reserved Acres	Area Government Land. Acres	Area Private Land Acres	Date of Proclamation	Proclamation Signed by
1	Kaipapau	Koolauloa	Oahu	913	913	....	Nov. 10, 1904	G. R. Carter
2	Hamakua Pali	Hamakua	Hawaii	18,940	16,333	2,607	Dec. 23, 1904	"
	Total, fiscal year ending June 30, 1905.	....	....	19,853	17,246	2,607		
3	Hilo	Hilo	Hawaii	110,000	60,223	49,777	July 24, 1905	A. L. C Atkinson
4	Koolau, Maui.	Koolau, Hamakualoa.	Maui	42,969	30,230	12,739	Aug. 24, 1905	" "
5	Haalelea	Haalelea	Kauai	37,500	10,990	26,510	Aug. 24, 1905	" "
6	Kealia	Puna	Kauai	9,935	7,385	2,550	Mar. 9, 1906	" "
7	Ewa	Ewa, Waianae and Waialua	Oahu	28,550	5.151	23,399	Mar. 9, 1906	" "
8	Honuaula	Kona	Hawaii	665	665	....	Apr. 4, 1906	" "
	Total, fiscal period ending June 30, 1906	....	......	229,619	114,644	114,975		
9	Kau	Kau	Hawaii	65,850	59,618	6,232	Aug. 2. 1906	G. R. Carter
10	Waianae-kai	Waianae	Oahu	3,257	3,150	107	Sept. 7, 1906	"
11	Lualualei	Waianae	Oahu	3,743	3,743	....	Nov. 30, 1906	"
12	Hana	Hana	Maui	14,625	13,767	1,058	Nov. 30, 1906	"
13	Na Pali-Kona.	Na Pali and Kona	Kauai	60,540	40,650	19,890	June 12, 1907	A. L. C. Atkinosn
	Total, fiscal year ending June 30, 1907.	....	....	148,215	120,928	27,287		
	Grand total	....	....	397,687	252,818	144,869		

NOTE: The final totals in this table have been corrected to agree with a change in area made since its compilation.
R. S. H.

FUNGI.

Amongst those who pick mushrooms how many there are who know very little about them! It is therefore perhaps not useless to recall here some details of mycology as it is now the time of the harvest. That which is called in vulgar parlance "The mushroom" is in reality only a part of the plant—the reproductive apparatus. The main plant is much less apparent and is generally underground, which explains that for a long time it was passed unnoticed. This portion has received from botanists the name of "mycelium," but it is often called "mushroom spawn." It is an assemblage of whitish filaments, often forming skeins, or long strands, usually white, but often of other colors, excepting green. In certain cases, such as truffles, for instance, the mycelium is in the form of an irregular blackish tuber, called a sclérote. The mycelium is more or less developed, according to the different species, and according to exterior conditions. It may itself constitute the whole of the plant, and itself produce spores; this is the case with all the lower forms of fungi. In any case, in the mushrooms, which are gaathered for eating, the mycelium plays only the part of the root of other plants; it is on this that the reproductive apparatus is developed, a receptacle or hood, which is the part sought for by lovers of mushrooms. The plant itself is very tenaceous of life, which explains why one frequently finds the same variety of mushroom in the same place for many following seasons. The underground plant can withstand many years of drought, merely throwing up no reproductive part; but should a favorable season come, the mushrooms, which had apparently disappeared from a field or wood, will again be found in abundance. The method of growth of the mycelium also explains a peculiarity which has been observed by all mushroom seekers, namely, the disposition in a more or less regular circle which they affect. This circumstance is simply due to the fact that the mushroom spawn forms a sort of disc which grows always from its outer edge, while the center part dies. The reproductive apparatus therefore develops itself naturally on the outer edge of the circle, where the vitality of the mycelium is greatest.

The reproductive apparatus is composed of a hood, a foot, (these two may both be missing however) and of spores. The latter are the only essential parts. These spores are usually contained in capsules on the under surface of the hood, on leaflets, as in ordinary mushrooms, or in tubes, as in the case of cepes. It is besides very easy to gather these spores: it is sufficient to place a mushroom for a day or two on a sheet of white paper, which will soon be covered with a white, pink or brown dust, which is formed by the mass of these spores.

These are minute spherical, or ovoid bodies of an extreme tenuity. One needs a very good microscope to distinguish the form, for some are no more than four to five-thousandths of a millimeter in diameter. They therefore are dispersed in the air with the greatest ease, and it may be said that they penetrate everywhere. It appears that the musty odor of closed and unventilated places is due to the dissemination of the spores of fungi. It is sufficient to plant the spores in suitable conditions to reproduce the fungi; the only difficulty is to realize the suitable conditions. The obstacles to obtaining these are such that it has been impossible to multiply fungi by artificial means, except for the ordinary edible mushroom and a few allied kinds.

We may say that fungi present every color, except green. The exclusion of this color is due to the total absence of chlorophyl—a substance which plays as we know a principal part in the existence of all other vegetation. One immediately deduces from this that fungi must possess a life differing radically from that of other plans. This is fully confirmed by experiment. Fungi live, not like vegetation, but like animals; they constantly absorb oxygen and give off carbonic acid; they are incapable of decomposing the latter in order to free the carbon. It is therefore absolutely necessary, that this carbon should be furnished them by some other means. As a matter of fact, fungi can only live on organic matter, sometimes living, but usually in a state of decomposition. From this they draw the carbon of which they have need, and thus destroy the organic matter on which they live. Fungi play therefore one of the most important parts in nature. It is they who dissolve combinations which have become useless, and replace their elements in circulation. A piece of dead wood, which for years would remain intact without the help of fungi, is destroyed by these in a short time, so that its elements may form new combinations and recommence a new cycle. One sees by this how beneficial the part played by fungi is. Besides, we must not understand by this term the few species which we eat; they are the infinitesimal minority. I will not say that the varieties of fungi are innumerable, for the patience of systematic classifiers is without limit, but they may be counted by the thousand. All forms of mildew, which attack bread, cheese, old wood, etc., are fungi. The ferments which transform the juice of the grape or the apple into wine or cider are fungi. Almost all germs which cause fermentation are fungi. Fungi again, but to which the epithet of beneficial cannot be applied, are most of the organisms which attack the grape vine; oidium, mildew, black rot, etc. Some years ago, botanists had listed three hundred and sixty parasitical fungi of the grape. Rust and the caries of wheat, ergot of rye, the potato disease, are due to fungi. It is the same thing with such

skin diseases as the mange of animals. Lastly, is it not amongst the fungi that we must place the different microbes (phthisis, typhoid, etc.) always fighting against our poor humanity? If this is so, the part played by fungi must be judged with less leniency. In any case, they are without doubt the greatest and at the same the smallest transformers constantly working in aid of nature.—Translated from the French of L. Pervinquiere in La Revue Hebdomadaire, 19, 10, '07.

THE ALASKA-YUKON-PACIFIC EXPOSITION.

Now that the Jamestown Ter-Centennial Exposition has closed, attention is directed toward the next great world's fair —the Alaska-Yukon-Pacific Exposition, which will be held at Seattle, Washington, opening June 1, and closing October 15, 1909.

This exposition will be held in a section of the country where world's fairs are new and for that and many other reasons it is expected to be a success, educationally, artistically and financially.

Work on the grounds and buildings is well under way and the management expects to have everything in readiness by the opening day. The undertaking promises to be different from former world's fairs in many ways, but one policy which has received general favor is that no money will be asked from the Federal Government to assist in the work.

All the management has asked the United States Government is that it participate in the same manner as foreign countries and the different states, by erecting buildings and installing exhibits therein. Former expositions have been aided by the government in many different ways. Outright gifts of large sums of money have been made by Congress to some world's fairs, while others have negotiated loans.

The bill that has been introduced at the present session of Congress provides an appropriation of $1,175,000 to enable the United States to take advantage of the opportunity for effective advertising. The money will be apportioned as follows:

	Building.	Exhibit.
Government	$200,000	$350,000
Alaska	100,000	200,000
Philippines	75,000	75,000
Hawaii	50,000	75,000
Fisheries	50,000	*

* The fisheries exhibit is included in the general government display.

On June 1 last, before a crowd of fifteen thousand persons, ground breaking ceremonies were held. Many prominent men made addresses on this occasion, among whom was the Hon. John Barrett, director of the International Bureau of American Republics. From that date until the present time work upon the exposition grounds has been going on rapidly. Most of the grading and clearing has been finished: all the principal roadways, avenues, circles and plazas have been completed: the Administration building has been erected and occupied by the executive force for several months: contracts have been let for the construction of five large buildings and for several small ones. Among these are the Manufactures building, Agriculture building, Auditorium, Palace of Fine Arts and Machinery Hall. The three latter buildings will be permanent structures, built of buff brick faced with terra cotta. The site of the exhibition is in the grounds of the Washington University, a state institution, and after the event is over the permanent buildings and those substantially built will be assumed by the college and be used for educational purposes.

The purpose of the exposition, which is to exploit Alaska and Yukon and the countries bordering on the Pacific Ocean, is receiving much favorable comment throughout the country. The opportunity for Hawaii to make a display of its local agriculture products is one which should not be lost sight of. At the recent local Poultry and Agricultural exhibition the display of the Federal Experiment Station and of the Territorial Board of Agriculture demonstrated the immense expanse of agricultural industries which is commencing to evidence itself in the Territory. Our rapidly growing pineapple interests, our sisal products, the splendid possibilities which the islands offer to white men who desire to engage in such profitable, health-giving, interesting pursuits as the growing of rubber, tobacco and vanilla should all be demonstrated. Apart from the general opportunity of making our commodities more widely known upon the mainland and of introducing them to the notice of agents and buyers, the desirability of introducing the wonderful agricultural resources of Hawaii graphically to an intelligent body of our own race, many of whom will possess not merely the desire but the means of establishing homes and small agricultural enterprises in the islands, cannot be over estimated.

AVOCADO PEARS.

The recent exhibition of ripe Avocado Pears in a Honolulu store suggests the advisability of endeavoring to establish a variety of the fruit which can be relied upon to become ready for table use at this season of the year. The cultivation of fruit to market either before or after the general season is a most profitable enterprise, and the production of choice avocados in those months when this fine salad fruit is out of season should well repay the experiment.

AGRICULTURAL NOTES.

CAMPHOR IN FRANCE.

The climatic conditions of southern France are such as to encourage the belief that the production of camphor there would be profitable, and the industry is at present receiving some attention.

THE JAPANESE CAMPHOR INDUSTRY.

Addressing a recent conference of camphor commissioners in Tokio, the Japanese Minister of Finance said that he was gratified to notice that the general public had become aware of the importance of the industry, and in order to meet the increasing demand he deemed it advisable to encourage cultivation. It required forty to fifty years to obtain raw camphor in trunks and roots, and in order to cover the pressing demand, he advocated the plantation on a large scale. He regarded the industry as most lucrative, and the forestry bounty, as sanctioned by the Diet last session, is mainly assigned to camphor plantation with that object in view. While thus encouraging the plantation and the improvement of camphor manufacture, the government intends, he said, to promote also the exportation of the product and to increase facilities for supplying the demand. For this purpose the government last year despatched commissioners to Europe and the United States to investigate the subject.

THE ARAUCARIAS.

Considerable interest always attaches to these graceful conifers, and in Hawaii where the climate is peculiarly suitable to their growth it is unfortunate that they are not more widely grown. The trees, which are confined naturally to South America, Eastern Australia and the Pacific Islands, are remarkable from a botanical standpoint in that they are the surviving representatives of typical prehistoric flora. Their graceful and distinctive appearance renders them invaluable for use in landscape gardening. *Araucaria excelsa*, the well known Norfolk Island Pine; *A. Cooki*, Captain Cook's Pine, and *A. imbricata*, the peculiar monkey puzzle, are well known species. The Agricultural Gazette of New South Wales for December last has splendid photographs of the Araucarias, especially of the first two species mentioned. These trees received greater notice than is given here, it will be remembered, in volume III of this publication.

BAHAMA PINEAPPLES.

The shipments of preserved pineapples from the Bahama Islands during 1906-7 amounted to 117,396 cases, nearly double the exports of the previous year. The Board of Agriculture of the colony has made a special grant of £100 to assist in cultural and manurial experiments with the crop.

TOBACCO IN ST. KITTS.

The experimental cultivation of tobacco in St. Kitts is still in progress. The results so far obtained are said to be promising and point to the eventual establishment of a cigar tobacco industry in the island.

A NEW RUBBER TREE.

A new rubber tree, *Palo Amarillo*, has been discovered in Mexico. It belongs to the same natural order as *Hevea* and *Manihot* and is reported to thrive on rocky soil in temperatures of from 62° to 68° F. and at altitudes of from 15,000 to 19,000 metres. The latex of the new tree is yellowish white and it does not coagulate rapidly. The yield of *Palo Amarillo* is said to be good and in view of the altitude and temperature at which it flourishes, if its cultivation proves to be profitable, this new tree will greatly extend the rubber producing area of the world.

SORGHUM POISON.

In its early stages of growth it is well known that sorghum or Guinea corn, frequently acts as a poison to cattle, and death has often resulted where animals have broken into a field of growing corn. The mature sorghum, however, is a safe food, and may be fed to stock with impunity. The poisonous properties of the young sorghum are due to the presence of prussic acid, but the amount present gradually becomes less as the plant grows older, and has practically disappeared by the time the seeds have ripened.

The Queensland Agricultural Journal, in a note on sorghum, advises that a good drink of sweet milk or of molasses diluted with water be given to any animal showing symptoms of illness after feeding on sorghum, as in experiments conducted by the Queensland Department of Agriculture, this remedy has been successful. Sweet potato vines also contain a glucoside which yields prussic acid, and the occasional death of pigs is attributed to this cause in Australia, although in the West Indies this vine is consumed in large quantities by cows, pigs and other stock, and as far as is known no fatal results have attended its use.

WHY COCKS CROW AND HENS CACKLE.

Birds living in a thick undergrowth require some means of knowing each other's whereabouts. All domestic poultry is descended from the jungle fowl (Galus Bankiva) and with them has, of course, come the note of call which remains with undiminished vigor. The use of the call we can easily understand, when we remember the conditions under which the wild birds exist. They keep in small flocks, headed by a single male, and travel over a considerable area in search of their food, which is found on the ground. Birds which take to the wing have ample means of keeping in touch with each other, and large ground varieties, such as the emu and ostrich, only inhabit the plains and can easily keep in view of their fellows.

The hens, which are at times detained from wandering, owing to stoppages for egg laying purposes, find it necessary to advise the rest of the flock of their whereabouts, and this is managed by a lusty cackle on depositing the egg. The cock bird of domestic poultry will often be noticed to come and express his approval of what has happened by sundry mutterings and splutterings in hen language, which is, no doubt, a traditional emotion handed down from the original stock. As to why the cock birds indulge in nocturnal crowing, it is rather more difficult to come to a logical conclusion, so one can but hazard the conjecture that it may be akin to the old watchman's cry of "All's well" at various intervals during the hours of darkness.—*Frank H. Robertson, Journal of Agriculture, W. A.*

WORLD'S EGG LAYING RECORD.

Mr. W. L. Williams of Sunnyhurst Poultry Farm has established a world's record in egg laying with 1,494 eggs for six birds, laid in 365 days—the previous record being 1,481 eggs. The six hens produced eggs which represented a net profit of about two and a half dollars per bird.

FOOD VALUE OF MILK.

Two pounds of milk contain the same amount of solid food as one pound of beef, and as a food, milk is more digestible.

MENDEL'S LAW OF BREEDING.

The Queensland Agricultural Journal for October, 1907, quotes in full, with due acknowledgments, Judge Weaver's poultry article published in a recent issue of the Forester, entitled "Mendel's Law of Breeding," which it characterizes as "highly interesting, valuable and instructive." It is gratifying to know that the Hawaiian Forester is appreciated beyond our own islands.

RUBBER IN AFRICA.

A special survey is being made of the chief rubber producing districts of French West Africa, and as one of the safeguards being adopted to protect the industry, when the investigation is finished, depleted areas will be closed to rubber collection until the plants have recuperated.

ROTATION OF CROPS ON TOBACCO LAND.

The following three course rotation for tobacco land is advocated in the Tropical Agriculturist by C. Drieberg, secretary, Ceylon Agricultural Society:

1. **Tobacco.**
2. **A leguminous crop, e. g.:**
   - *a* Green gram (mun) *Phaseolus Max.*
   - *b* Black gram (ulundu) *Phaseolus radiatus.*
   - *c* Bengal gram (kadala) *Cicer arientinum.*
   - *d* Horse gram (kollu) *Dolichos biflorus.*
   - *e* Common bean (bonchi) *Phaseolus vulgaris and luntatus.*
   - *f* Dwarf long bean (gas-me) *Vigna catiang.*
   - *g* Ground nuts (rata-kaju) *Arachis hypogoea.*
   - *h* Dhall (rata-thora) *Cajanus indicus.*
   - *i* Sunn hemp (hane) *Crotalaria juncea.*

   N. B.—The plants to be dug into the soil after the crop is harvested.
3. **Grain Crop.**
   - *a* Paddy (if possible) *Oryza sativa.*
   - *b* Kurakkan—*Eleusine coracana.*
   - *c* Amu—*Paspalun scrobiculatum.*
   - *d* Mineri—*Panicum miliare.*
   - *e* Tanahal—*Setaria italica.*
   - *f* Species of *Sorghum.*
   - *g* Indian corn (bada iringu) *Zea Mays.*

   N. B.—The straw to be returned to the land after harvest.

BEES IN CEYLON.

Bees in Ceylon appear to make much use of flowering shrubs and herbaceous plants. The coconut, which is always in flower, appears to be their chief source of honey in the low country, but they also take advantage of the flowering season of the Mango, Padowk *(Pterocarpus indica)*, Bulu *(Terminalia belerica)* and Henna *(Lawsonia alba)*. Among garden flowers Cosmea, Portulaca and Sunflowers are frequented. The Lantana does not appear to be made use of, although its name occurs in a list of West Indian bee plants.

A HUNDRED MILLION TIES A YEAR.

Railroads Paid $50,000,000 in 1906, and Used Timber Equivalent to the Whole Product of 600,000 Acres of Forest.

In the construction of new track and for renewals, the steam and street railroads used, in 1906, over one hundred million cross-ties. The average price paid was 48 cents per tie. Approximately three-fourths of the ties were hewed and one-fourth sawed.

Oak, the chief wood used for ties, furnishes more than 44 per cent., nearly one-half of the whole number, while the southern pines, which rank second, contribute about one-sixth. Douglas fir and cedar, the next two, with approximately equal quantities, supply less than one-fifteenth apiece. Chestnut, cypress, western pine, tamarack, hemlock, and redwood are all of importance, but no one of them furnishes more than a small proportion.

Oak and southern pine stand highest in both total and average value; the average value of each is 51 cents. Chestnut ranks next, followed by cedar. Hemlock, at 28 cents, is the cheapest tie reported.

More than three-fourths of all ties are hewed; and with every wood from which ties are made, except Douglas fir and western pine, the number of hewed ties is greater than the number sawed. About ten times as many Douglas fir ties are sawed as are hewed. Of the oak ties a little over one-sixth and of the southern pine ties less than one-third are sawed. In contrast to the southern pines is the western pine, of which more than one-half the ties are sawed. In general, when lumber has a relatively low value the proportion of sawed ties increases, because the market for ties is always active, while that for lumber is frequently sluggish. All western species are affected by this condition, for stumpage is abundant and its value relatively low.

Ten per cent. of the ties purchased were treated with preservatives either before they were purchased or at the treating plant of the railroad company. At least ten railroad companies are operating their own plants for the preservation of their construction material.

Of the many forms in which wood is used, ties are fourth in cost, sawed lumber being first, firewood second, and shingles and laths third. It has been calculated that the amount of wood used each year in ties is equivalent to the product of 600,000 acres of forest, and that to maintain every tie in the track two trees must be growing.

With nearly 300,000 miles of railroad trackage and approximately 2,800 ties to the mile, there are over 800,000,000 ties constantly subject to wear and decay. The railroads report that in the form of ties cedar lasts eleven years, cypress ten years, and redwood nine years. These woods, however, lack the desired weight and hardness, and, what is more important, they are not available in the region of the trunk lines of the Central and Eastern States. When it is considered, then, that the service of the longest-lived tie timbers is general use—chestnut, white oak, tamarack, spruce, and Douglas fir—is but seven years, while with some, as the black oaks, it is but four years, whereas a treated tie with equipment to lessen wear will last fifteen years, it is apparent how much the railroads can save if preservative treatment of ties is universally adopted. The saving in the drain upon the forests is of even greater moment.

Details of the consumption of ties in 1906 are contained in Circular 124, just issued by the Forest Service in coöperation with the Bureau of the Census. This pamphlet can be secured by application to the Forester at Washington, D. C.

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FLORAL PARADE.

The increasing popularity of each successive Floral Parade in Honolulu renders the permanence of this picturesque event assured. The policy of selecting the Twenty-second of February has proved a most judicious one, and the hearty manner in which all nationalities in Honolulu vie with one another to add to the success of the day is one of the most gratifying features of its celebration, and affords an apt illustration of the harmony and good will which underlies the close association of many races who, to an unthinking observer, might be supposed to possess little in common.

There is, however, one phase of the parade which cannot be viewed but with regret. To the lover of the beautiful in nature the almost total absence of natural flowers in a floral celebration is disappointing in the extreme, and one difficult to reconcile with a land whose name we would wish to be associated on the mainland with a prodigality of floral wealth. It is not, however, from the artistic standpoint that we would desire this condition of affairs to be remedied, but from the utilitarian one of the advantages which would be derived from encouraging the more extensive practice of floriculture in Honolulu.

For a country so wonderfully adapted to the growth of flowers, Hawaii is remarkably deficient in those varieties suitable for decorative purposes. This is the more surprising when it is considered what good prices may be obtained for them and how profusely and quickly they may be grown when care and proper methods are applied. And this last we say advisedly for as it is always necessary that the peculiarities of local conditions be studied well in order to produce good results in any department of agriculture, with respect to the growth of flowers for cutting in Hawaii this is especially necessary. However, the difficulties when once understood are readily overcome and a full measure of pecuniary reward is assured to anyone who undertakes the work intelligently.

The establishment of a competitive class restricted to vehicles decorated with natural flowers would do much to promote interest in this subject. In order to be operative next year it would

be necessary to announce such a decision sufficiently early to allow of the production of flowers by the necessary date. The recognition by the Parade Committee of this, although one of the smallest, yet one of the most beautiful of agricultural industries, would in time afford such stimulus to the growing of flowers for cutting that our general market supply would not be so uncertain or confined to such a few varieties as it is at present. In course of time we would hope to see the use of natural flowers in the Parade so extended that the artificial ones would become relegated to a secondary position and finally put under the ban altogether.

We are aware that the merits of artificial floral decorations are great, particularly in respect to their being free from the frailty of withering and their accessibility at all seasons of the year, but we would like to see a standard adopted which would look to genuineness alone, beyond ostentatious display and facility of use.

If the difficulties of obtaining genuine blossoms are great, so much the more merit to those whose care has produced them. If the inherent qualities of some varieties of natural blossoms to wither, when exposed to a bright sun, are likely to destroy the appearance of a car decorated with them, so much the more deserving of honor those whose resources have overcome such an obstacle or whose energies have been expended in cultivating flowers suited to withstand such a trying ordeal.

THE COMING FLEET.

Now that the visit of the fleet to Honolulu has been removed from the realm of uncertainty, it is in order to discuss the various problems with which its reception will be accompanied. The arrival of the largest number of people who have ever visited the Hawaiian Islands at one time—and indeed of probably the largest number of individuals who have embarked upon the Pacific Ocean together—is necessarily attended with many difficulties of victualing. These are intensified by the smallness of the white community in Honolulu and also by the fact that the visitors who are to be entertained possess the same tastes and inclinations and will make similar demands upon our meagre commissariat as we ourselves do.

It is to be expected that with regard to all preserved foods, such as canned and dried meat, fish, fruit and vegetables, and to all grocery supplies the fleet will come adequately provisioned, or will receive here renewed stores for which the government has without doubt already made arrangements. With regard to all fresh provisions, fruits, vegetables, meat and fish and to dairy produce, however, the local market will be taxed to an

unprecedented extent. The arrival of many thousands of visitors to a white population of perhaps four thousand, will at once increase fourfold the demand upon many ordinary comestibles. No market the world over could be expected to fully satisfy such a demand and certainly not the Honolulu one, which has no extensive territory to fall back upon to renew its supplies.

However, much can be done by foresight, and growers of vegetables who at once increase the planting of all produce which can be marketed at the time of the fleet's visit, are likely to derive an exceedingly profitable return. There is little likelihood of over supply even if every vegetable garden in Honolulu quadruples its output during the time in question, and with the anticipated demand to be satisfied at prices at least double the normal rates, the prospect should attract many novices to the ranks of the humble vegetable grower.

UNITED STATES FOREST SERVICE.

It is doubtful if any of the laboratories maintained by the government for scientific research is more unique in character, and yet bears promise of more important results, than one which has just been established in Washington by the United States Forest Service for investigating the structure of commercially important woods.

Laymen will not understand the significance of the proposed investigations carried on in this laboratory so quickly as architects, builders and other wood users, who in these days of growing scarcity of the more valuable woods are seriously perplexed in identifying substitutes. Mistakes of this kind in identification have, in the last few years, in several instances, meant the loss of large sums of money and many embarrassing law suits.

Nearly any user of lumber can recognize, and name off-hand, all the usual trees of the forest when he sees them growing, and not much difficulty is encountered in identifying the common kind of lumber in a mill yard because he knows the few trees from which the yard lumber comes. But common kinds are growing scarce, and woods not often cut heretofore, are appearing in the markets. The most experienced men are sometimes puzzled when they try to identify them, and persons with less experience have still more trouble. Is a certain wood gum or elm? Is another cucumber, linn, or poplar? Is a stick sugar maple or red maple? Doubts may arise whether a piece is hemlock or spruce, or whether it is lodgepole pine or fir, or whether a shingle is cypress or cedar. A dealer may buy red oak and suspect that he is getting something else. There are thirty or more important species of oak. The best

lumber dealer might not know which is which in the lumber pile, or if he knows, he might not know how to prove it.

Many of these woods look alike, even to the trained eye of the millman or the builder, and yet they are widely different in value for certain purposes, and it is of the greatest importance to be able to distinguish them quickly and certainly. Again, a new wood may come to a man's notice for the first time, and it may be necessary for him to decide what it is and what it is worth.

The government has been helping individual lumber users for some time, but the facilities have not been nearly so complete as they are now. It is to meet such needs and answer such questions, that the Forest Service has established the laboratory, and placed it in charge of a trained dendrologist. Architects, lumbermen, manufacturers and makers of woodware are already sending in samples of wood for identification, and asking if there are not some structural characters by means of which such woods may be conveniently separated from relative species having greater or less value for some specific purpose.

The laboratory will investigate in a practical way. The structure of the woods, sections lengthwise and crosswise, will

AN OLD CAMPHOR TREE GROWING NEAR A SHRINE AT ATAMI, JAPAN.

be studied so as to separate by structure alone the various species of a genus. Analytical keys to the trees of each group will be worked out. These will be based on the arrangement and character of the pores discernible to the naked eye, or by a hand lens.

The results will be published from time to time with good illustrations and placed at the disposal of lumber users. After all the important groups of wood, such as oaks, pines and firs, have been studied and the results published separately, the several monographs will be collected and published in one volume.

A work of this character has long been in demand by architects, builders and other users of lumber. It will, in most cases, enable even a non-technically trained man to determine quite readily the wood he deals with by means of an ordinary hand lens and by comparing the wood in question with the photographs of cross and long sections given in these monographs.

TURMERIC AND RUBBER.

The value of Turmeric *(Curcuma longa)* as a valuable catch crop in young rubber clearings has been recently investigated in India, with good results. Turmeric has a well established place in the market and the demand for it should render its cultivation profitable. Its chief use is as an ingredient in curries, into nearly all of which it enters in varying proportions. The medicinal properties of the plant are recognized by both oriental and occidental nations, and as a brilliant but not permanent dye it has long been used.

Regarding its cultivation among rubber trees a writer in the *Madras Mail* contributes the following:

A plant which might very profitably be grown between young Para rubber trees is turmeric *(Curcuma longa)*, which requires a good soil and a warm, moist climate. Some wild statements have been made as to the yields which have been obtained per acre, but it would appear that, under ordinary circumstances, 2,000 lbs. of roots may reasonably be expected from each acre planted, and this is calculated to bring in a return equal to that from sugar cane, viz., R300. The time for planting depends on the rains, but it is usually at the end of May, the crop being either lifted in the following March or April, or allowed to remain in the ground for twenty-one months. By the former method the produce is said to be less in quantity and inferior in quality. Good points about turmeric cultivation are that the curing after harvesting is simple and a market at hand is always obtainable. The preparation

of the soil necessary for turmeric is similar to that for ginger, but lands intended for the former need not be worked so fine as for the latter. Indeed, in some parts of India, notably in Mysore, turmeric is found growing wild. Another species of *Curcuma, C. angustifolia*, or narrow-leaved turmeric, is largely cultivated in India as a source of arrow-root, especially on the West Coast, and it also grows wild over a large area. According to an old report of the Saidapet Farm a plot a quarter of an acre in extent was planted with this crop at the end of 1879. The crop was taken up at the end of January, 1881, and yielded 986 lbs. of tubers, or at the rate of 3,944 lbs. per acre, which would represent about 493 lbs. of flour per acre. Another plot yielded tubers at the rate of 7,500 lbs. per acre. The flour, it is said, sells at 4 as. per lb.

KOOLAU RUBBER CO.

At a recent meeting of the Koolau Rubber Co. it was reported that the plantation now owns 287 acres of Ceara rubber trees, half of which will be ready for tapping in about a year's time. The affairs of the company are said to be in the best of condition, and its trees are all growing well.

TUBER RUBBER.

In response to a request by a subscriber, we publish the following information from The Agricultural News Barbados:

"A plant has been discovered in Portuguese East Africa, possessing a fleshy, tuberous, turnip-shaped root, the entire substance of which is permeated with laticiferous ducts, that yield a supply of rubber latex. The plant belongs to the natural order Asclepiadaceæ. Rubber has been obtained from the tubers by slicing them, applying pressure, and coagulating with alcohol. Tubers two years old attained a weight of nearly 1½ pounds, and a rubber yield of a half of 1 per cent. of the total weight. Professor Geraldes of Lisbon, who reports on the plant, regards as possible the production of over 180 pounds of rubber per acre at the end of two years.

"It may be mentioned that the term 'potato rubber' formerly sometimes used in the trade, did not, as some suppose, relate to rubber obtained from a tuber, but merely to the appearance of the small balls in which certain rubbers came to market."

RATS.

There is no single animal in the whole world which causes more loss and damage, and is the carrying source of more disease than the rat. It is everywhere; in every country; in fields and dwellings, in the country and in the city, living in the ground, in bushes, in trees, in rocks, absolutely everywhere.

There is no animal like it for vitality, prolificacy, persistency and cunning. It is frugivorous, carnivorous, granivorous, in fact omnivorous to an extent more than any other animal. It is not only what it eats; it destroys, spoils and pollutes twenty times more—nothing comes amiss to it. It will carry off clothing and curtains in a house to make its own bed, and it will make its nest in a wardrobe among the best clothes. If a house is left unoccupied for a few weeks, when the owners are on holiday, they may find their beds occupied by nests of rats when they return. The best leather harness will be chewed through, just as readily as the binding of the best books. It is a deadly pest to the young of all animals; chickens and ducklings are never safe from it no matter where they are kept. It will eat young pigs, and even attack young lambs. Young children left to sleep alone have been badly bitten by rats; this has been a common occurrence. Grain-growing countries find it their worst pest. It destroys grain when newly planted, in the ear, when stored, when shipped in a ship's hold, on the wharf, at the railway depot.

Here in Jamaica when sugar-cane was our most important crop, some estates paid as much as £300 to £400 a year for rat catching alone. Now sugar estates are almost safe from its attacks, thanks to the introduction of the mongoose. But for this and the throwing up of so many estates, rats finding their most convenient food scarce, would have swarmed everywhere doing great damage to all other crops. Rats are still our worst enemy to poultry, to corn, and especially to coffee, and cocoa crops, the latter of which is of such growing importance. Thousand of pounds are lost by damage to cocoa pods through rats now, but if we had no mongoose to check them, cocoa growers would have to spend as much as cane-growers did in the past, to save their crops; yet no creature is more cursed than the mongoose, simply because it takes chickens which are wandering back from the domicile in the bush. The mongoose is a timid animal, easily kept in check, readily entering traps, hunting solely by day, and falling an easy prey to dogs. He is not responsible for more than a tenth part of the loss of young poultry that the rat is responsible for, and if it were not for him at present, poultry-rearing would be a much more difficult task than it is.

The mongoose lives in the field, and does not venture in the open, but the rat is everywhere, especially in the field, in the dwelling house, in the poultry house, working at night, stealthy, cunning and audacious.

The scarcity of bird life is charged against the mongoose, yet those birds which build in trees are equally scarce with ground birds. We have found nests of rats in nests built by nightingales and blackbirds. Adding insult to injury, the rats, having eaten the eggs or young, occupy the nest themselves. The outcry against the mongoose is foolish, is unthinking, is hysterical.

The rat breeds three or four times a year, producing from six to twelve young, which breed again when they are four months old.

Rats are hard to trap, and are suspicious of poisoned baits. Every householder in Jamaica should wage continual war against rats by keeping cats, setting traps, using Rat Virus, and laying suitable poisons in a suitable way for safety to domestic animals. The out-of-sight trap is the most effective; but it is necessary to oil the hands with coconut oil when handling it regularly, otherwise rats get wary even of it. The ordinary iron traps should also be used, two different kinds, and whenever rats do not go into one kind use the other trap for awhile, and change the kind of bait. The only safe way of laying poison outside is to use a double bamboo joint—that is with the joint in the middle open at both ends, a bait is placed in each end, and so dogs, cats or poultry cannot get at it. A different kind of bait should be used every week—that is important. Roasted saltfish, or end of bacon, toasted rind of cheese form the best baits, but ripe bananas and a crust of bread often do as well.

Poisoning.—Barium Carbonate.—One of the cheapest and most effective poisons for rats and mice is barium carbonate, or barytes. This mineral has the advantage of being without taste or smell, and, in the small quantities used in poisoning rats and mice, is harmless to larger animals. Its action on rodents is slow but reasonably sure, and has the further advantage that the animal, before dying, if exit be possible, usually leaves the premises in search of water. Its employment in houses, therefore, is rarely followed by the annoying odour which attends the use of the more virulent poisons.

The poison may be fed in the form of a dough made of one-fifth barytes and four-fifths meal, but a more convenient bait is ordinary oatmeal, with one-eighth of its bulk of borytes, mixed with water in a stiff dougth; or the barytes may be spread upon bread and butter or moistened toast. The prepared bait should be placed in rat runs, a small quantity at a time. Elsewhere strychnine may be employed with great success. Dry strychnine crystals may be inserted in small pieces of raw

meat, Vienna sausage or toasted cheese, and these placed in the rat runs, or oatmeal may be wetted with a strychnine syrup, and small quantities laid out in the same way.

Strychnine syrup is prepared as follows: Dissolve an half ounce of strychnia sulphate in a pint of boiling water; add a pint of thick sugar syrup and stir thoroughly. A smaller quantity of the poison may be prepared with a proportional quantity of water. In preparing the bait it is necessary that all the oatmeal should be moistened with syrup. Wheat is the most convenient alternative bait. It should be soaked overnight in the strychnine syrup.

Other Poisons.—The two poisons most commonly used for rats and mice are arsenic and phosphorus, nearly all commercial preparations containing one or the other as a basis. While experiments prove that rats have great powers of resistance to arsenic, it may sometimes be used advantageously as an alternative poison. Preparations of phosphorus sold by druggist are often too weak to be effective; and home made mixtures, when of sufficient strength, are dangerous, as rats may carry the baits into walls and crannies and thus cause fires. For these and other reasons we do not recommend preparations containing phosphorous.

Poison in the Poultry House.—For poisoning rats in buildings and yards occupied by poultry, the following method is recommended: Two wooden boxes should be used, one considerably larger than the other, and each having two or more holes in the sides large enough to admit rats. The poisoned bait should be placed on the bottom near the middle of the larger box, and the smaller box should then be inverted over it. Rats thus have free access to the bait, but fowls are excluded.

CUSTOM'S REVENUE.

Hawaii figures twelfth in a list of the twenty leading ports of the United States in the amount of customs revenue collected for the fiscal year ending June 30, 1907 The amount collected represents nearly a million and a half dollars.

HAWAIIAN BEE KEEPERS.

At the annual meeting of the Hawaiian Bee Keepers' Association the following officers for the current year were elected: President, A. F. Judd; vice-president, T. V. King; secretary, D. L. Van Dine; treasurer, J. O. Young.

THE BANANA, HOW IT IS SHIPPED FROM THE WEST INDIES TO EUROPE.

The bananas with which the British public is familiar, and with which Europe in general is becoming acquainted, are chiefly those which come from Jamaica and Costa Rica. The quantity brought from these countries exceeds by a million and a half bunches the quantity sent from the Canary Islands.

The plant attains perfection on the alluvial soil along the coast line of Central America and in Jamaica. By tracing its progress from the point of loading to the point of delivery it is possible to obtain some idea of the amount of care and attention which the shippers are bound to bestow on the fruit in order to ensure its reaching our shores in the proper condition.

The fruit is necessarily gathered in the green state, and it is gradually ripened by the measures taken on shipboard, in the railway trucks, at the local distributing centres, and in the grocers' shops. In the banana ships it is kept at an even temperature by means of a cool air system, and when it arrives at Manchester or Bristol it is conveyed to all parts of the country in specially fitted trains, heated by steam in the winter months and carefully ventilated in the hot weather.

The steamers which have been built for the trade by Elders and Fyffes, are fine vessels, each with a capacity of 60,000 bunches. They carry no other cargo, and are even sent out to the West Indies empty. A fleet of a dozen of these banana ships is kept constantly employed in bringing supplies of what is at once the most popular and nutritious of fruits.

The unloading of a steamer after arrival is a sight worth seeing. The first step is to lift by crane-power the enormous cages filled with bananas, which occupy the space of the hatchway area from the upper to the bottom deck. After these cages are removed, the hatchway being clear, it is possible to start discharging the fruit, with the aid of elevators, from either of the four or five decks as may be found expedient. It takes from 250 to 400 men to unload a single vessel, the cargo of which will fill about 500 railway trucks, and the work is invariably accomplished in one day.

In different parts of the country some 45 depots have been established, where the fruit is properly stored in large quantities, and whence the retailers can draw their supplies. For dealing with the London trade there is a large warehouse at King's Cross, in which 20,000 bunches can be hung. The fruit is transferred thither straight from the railway, and is kept under the best conditions, very careful attention being paid to matters of ventilation, temperature, and cleanliness. All this goes to show how thoroughly and scientifically the trade has

been organized, and as a consequence the retailers are becoming daily more impressed with the wisdom of treating bananas with care.

When justice is done to it, the fruit has a peculiar fascination for the great majority of people, and justice can only be done to it when it is eaten ripe. This is the point which banana eaters should bear in mind, and if they would only free themselves from all prejudice in the matter of appearance, the consumption of the fruit in an unfit condition would quickly cease. —*Exchange.*

THE SMALL FARM.

"The feeling in Hawaii is almost universal that the foundation of her prosperity is the small farm."—Judge Hatch, Mohonk Conference.

A CHANCE FOR OUR RUBBER GROWERS.

Honolulu, Hawaii, March 4, 1908.

Editor Advertiser: The first International Rubber Exhibition ever held in Europe will take place from September 21st to September 26th, 1908, at the Royal Horticultural Hall, London.

"The main object of the exhibition is to direct and compel public attention to the enormous advances made by the rubber producer and manufacturer during recent years. Extraordinary results beneficial to the entire rubber industry were achieved by the Ceylon Exhibition in 1906 and since that date many important inventions and improvements have been introduced.

"This exhibition will give the first opportunity in the Old World of enabling planter, dealer and manufacturer to bring the results of their labor before the public and none of them can, in justice to their interests, neglect the chance of doing so.

"The organizers of the exhibition are arranging for the delivery of illustrated lectures and addresses on rubber, its uses, etc. There will be an effort to secure entries of all the accessory apparatus used by rubber collectors or rubber planters, such as tapping knives, latex cups, collectors, transporters, sieves, pails, coagulators, coagulating agents, washing machines, presses, vacuum dryers, smoking apparatus, packing cases, pruning knives, sprayers, as well as machinery of every description required by planters; crude and prepared rubber of every description; seeds, gutta-percha and other tropical gums; and, in the manufacturing section, every class of rubber goods from boots and shoes to roofing compounds and India rubber substitutes."

It is hoped that Hawaii will be able to send exhibits in many of these classes, and it would also be well for the Rubber Growers' Association to consider the matter of the attendance of some one or more of its membership.

Yours truly,

JARED G. SMITH,
Special Agent in Charge.

—*Pacific Commercial Advertiser,* March 6, 1908.

PRESERVATION OF PILING AGAINST MARINE BORERS.

The length of service of piles in wharfs and other marine structures is greatly shortened by the attack of marine borers, or shipworms. A method of protection, both efficient and cheap, is much needed, the more so because the timbers best suited for piling are becoming very scare and are increasing rapidly in price.

Marine borers are found as far north as Maine and Alaska, though they are more numerous and destructive in the warmer waters farther south. Since they require only a small exposed surface in order to gain entrance and completely destroy a pile, any effective means of preservation must protect the wood from high-water mark to a point in the mud below which the borers do not go.

A number of excellent methods have been devised for protecting piling by external coatings or sheathings, any of which, properly applied, will increase the life of the pile. Three factors which decrease their efficiency are the corroding action of salt water, the wash of the waves which injures and often breaks the casing, and the dangers from floating timbers and debris. Thick iron cases resist damage from these sources for a long period, but they are very expensive.

The injection of preservatives through holes bored in the top of the pile, or near the mud line, has failed to secure a distribution sufficient to adequately protect the outer layer of wood. All soluble salts have also shown a tendency to leach out when exposed to salt water. Impregnation with creosote, a coal-tar product, has usually proved highly efficient with suitable kinds of timber properly prepared when a sufficient quantity of good creosote is used.

The principal timbers used for piling are longleaf, shortleaf, and loblolly pine, and white and red oak on the Atlantic coast and Gulf of Mexico, and Douglas fir on the Pacific coast. Spruce, redwood, cedar, cypress, eucalyptus and palmetto are used locally. All of these woods with the exception of palmetto are subject to damage by borers. Hardness is not a complete barrier to their attack, although boring is probably slow in dense woods. Southern pine and oak can be impregnated with creosote, and this promises to be one of the most efficient means of resisting the borers.

Circular 128, just issued by the Forest Service, gives a detailed description of the most important marine borers and their habits, together with a discussion of the different forms of mechanical devices in use for the protection of piling and of protection by chemical preservatives. This publication will be sent free upon application to the Forester, Department of Agriculture, Washington, D. C.

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

DIVISION OF FORESTRY.

THREE NEW FOREST RESERVES.

On February 24, 1908, Governor Frear held a Public Hearing in the office of the Board of Agriculture and Forestry in Honolulu to consider the setting apart of the West Maui Forest Reserve, the Makawao Forest Reserve, also on Maui, and the Waiaha Spring Forest Reserve in North Kona, Hawaii. There was no opposition to any of the reserves. On the contrary, numerous statements were made and letters read endorsing the action taken as wise and proper. Official proclamations will be issued in due course.

As the name indicates the West Maui Forest Reserve embraces the entire top of the West Maui Mountain above the limit of the agricultural land. The Makawao Forest Reserve consists of a portion of the Government land of Makawao on the slope of Mount Haleakala. The Waiaha Spring Reserve is a remnant of Government land on the slope of Mount Hualalai. All three tracts are set apart because of their value for water conservation. The areas of the three tracts are as follows:

WEST MAUI FOREST RESERVE.

	Acres.	
Government Land—		
Unleased	7,860	
Leased	9,145	
Lahainaluna	17,005	
School Lands	2,100	
	19,105	
Private Land	25,335	
		44,440

MAKAWAO FOREST RESERVE.

Government Land—	
Unleased	1,796

WAIAHA SPRING FOREST RESERVE.

Government Land—	
Unleased	193

Following the usual custom of the Board of making public all its important business, there are published herewith the various reports and resolutions having to do with the West Maui and the Waiaha Spring Forest Reserves. Those dealing with the Makawao Forest Reserve appeared in the Forester and Agriculturist for August, 1907. (Vol. IV, Number 8, pages 241-245.)

WEST MAUI FOREST RESERVE.

RESOLUTION RELATING TO THE PROPOSED WEST MAUI FOREST RESERVE.

Resolved, that those certain lands in the District of Lahaina, Kaanapali and Wailuku, Island of Maui, which may be described in general terms as embracing the entire top of the West Maui Mountain above a line so encircling the mountain as to exclude all agricultural land and containing an area of 44,440 acres, more or less, as recommended in a report of the Committee on Forestry, dated January 15, 1908, based on a report of the Superintendent of Forestry, dated December 7, 1907, which reports are on file in the office of the Board of Agriculture and Forestry; the boundaries of which proposed reservation more particularly appear by and on a map made in July, 1907, by the Hawaiian Government Survey Department, which said map is now on file in the said Survey Department, marked "Registered Map No. 1268," and "West Maui Forest Reserve"; and a description accompanying the same, numbered C. S. F. 1854; which said description is now on file in the said Survey Department; copies of which said map and description are now on file in the office of this Board and made a part hereof; be approved as a forest reserve to be called the West Maui Forest Reserve.

Resolved that the Board recommends to the Governor that the government lands lying within the boundaries of the said proposed West Maui Forest Reserve be set apart by him, subject to vested rights therein, after the hearing required by law, as the West Maui Forest Reserve.

Adopted at a meeting of the Board of Agriculture and Forestry held on January 15, 1908.

REPORT OF THE COMMITTEE ON FORESTRY.

To the Board of Commissioners of Agriculture and Forestry:

At a meeting of your Committee on Forestry, held Tuesday, January 14, 1908, at 10 A. M., at the office of the Chairman in the Judd Building, the following recommendations were unanimously agreed upon:

WEST MAUI FOREST RESERVE.

Your Committee recommends that the Board take favorable action on the report of the Superintendent of Forestry, under the date of December 7th, 1907, outlining the establishment of the West Maui Forest Reserve, to contain an approximate area of 44,440 acres.

Respectfully submitted,

(Signed) G. R. CARTER, *Chairman,*
" W. M. GIFFARD,
" C. S. HOLLOWAY,
Forestry Committee.

Dated Honolulu, January 15, 1908.

The foregoing report was approved by the Board and ordered placed on file at the meeting held on January 15, 1908.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

Honolulu, December 7, 1907.

Committee on Forestry,
Board of Agriculture and Forestry,
Honolulu.

Gentlemen:—

I have the honor to submit herewith a report with recommendations, on the project to create a forest reserve in the Districts of Lahaina, Wailuku and Kaanapali, Island and County of Maui, to be known as the West Maui Forest Reserve. This report is based on investigations made by me during different visits to Maui, but particularly during May and June, 1907, when in company with Mr. S. M. Kanakanui, of the Government Survey Office, I fixed on the ground the main points along the proposed boundary.

LOCATION.

The section included in the proposed West Maui Forest Reserve may be roughly described as embracing the entire top of

the West Maui Mountain above a line so encircling the mountain as to exclude all agricultural land. The proposed reserve contains an area of approximately 44,440 acres.

OBJECT.

The object of the West Maui Forest Reserve is essentially to protect the forest cover on the West Maui Mountain. The primary value of this forest consists in its beneficial influence on the streams that rising on the West Maui mountains are turned to economic account for irrigation, power development, domestic supply and other uses. By preserving intact the present forest, and by extending it where it is necessary to again clothe with vegetation bare areas or open spaces within the reserve boundary, it is the purpose of the reserve to maintain and increase the favorable influence now exerted. The forest on the West Maui Mountain is therefore properly to be classed as a "protection forest" and as such should be treated in the manner already recommended for other reserves of the protection forest class that have been created in the windward districts on several of the islands in the Hawaiian Group.

In the case of West Maui forest protection is a particularly important matter. With two or three exceptions, in the Kaanapali district, all of the streams of any size coming from the West Maui Mountain are now put to use. In several cases the water is made to do double duty, by being forced to turn power wheels on its way to the irrigation ditches. Considering the large areas of agricultural land that can only be made profitably productive through irrigation with water from the West Maui Mountain, the protection of the streams from which it comes is highly important. The West Maui Forest Reserve is therefore to be considered as one of the essential units in the chain of Territorial forest reserves that is now being established.

DESCRIPTION.

Topography.

In topography the West Maui Mountain is bold and rugged. An ancient volcanic uplift, the mountain mass is deeply fissured on all sides by great gulches that have been cut by long continued erosion. Narrow ridges and steep, often precipitious slopes further characterize the section and make it one of great scenic interest. Some of the gulches like the Iao Valley, back of Wailuku, are well known for their picturesque beauty. Others less often visited, like Ukumahame and Kahakuloa are quite as wonderful in rugged sides and wealth of vegetation. All the larger valleys carry streams that, beside making it a section of economic importance, add further to its beauty.

Ownership.

Of the total area of the proposed reserve (44,440 acres) somewhat over half is held by private individuals or corporations, while of the Government land (17,005 acres) all but 7,860 acres is under lease for varying terms. Under the provisions of the forest reserve law, as amended at the 1907 Session of the Legislature of Hawaii, all of the Government land can, however, be set apart, the full reservation to take effect immediately on the unleased portion and, automatically, at the expiration of the existing leases, on the remainder.

The privately owned lands within the reserve are at present almost without exception owned either by one or another of the large sugar plantation companies on West Maui or by the Honolua Ranch. It is the desire of each of these companies to maintain on the mountain the favorable conditions of forest cover now existing. To this end all are in harmony with the purpose of the government in creating the reserve and all have expressed their intention of continuing to maintain as private reserves, the forest areas now so held by them.

In the Lahaina District there are within the reserve portions of three lands belonging to the Lahainaluna School, namely Kuia, Panaewa and Paunau. They are not called "Government lands" as they have been definitely turned over to the Department of Public Instruction. Neither are they strictly to be classed as private lands, although for the sake of convenience they may be so considered. An agreement is now pending whereby the management of these lands may be turned over to this Board by the Board of Public Instruction, as provided by law for privately owned lands. The three lands together form one block with an area of 2,100 acres.*

A full list of the lands making up the proposed West Maui Forest Reserve, with the area of each within the reserve boundary, is given as part of the official description. Following is a list of the Government lands, portions of which are included in the reserve, with the names of the present lessees, the dates of expiration of the existing leases, and the area in the reserve of each land:

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* While this report was in the hands of the Committee on Forestry an arrangement was made whereby the Department of Public Instruction will turn back to the Territorial Government the portions of these lands within the West Maui Forest Reserve. The Governor will then set them apart with the other unleased government lands within the reserve boundary. In giving up the lands the Department of Public Instruction reserves certain rights of wood and water for the Lahainaluna School.

Lahaina District.

Land	Lessee	Lease Expires	Area Acres
Ukumehame and Olowalu	Unleased		7,655
Puuiki	Unleased		205
Wahikuli	Pioneer Mill Co.	April 1, 1913	1,550
	Wailuku District.		
Kou	Wailuku Sugar Co. (in part)	June 14, 1919	285
	Kaanapali District.		
Kahakuloa	Wailuku Sugar Co.	July 1, 1913	5,900
Honokawai	Pioneer Mill Co.	April 1, 1912	1,410
		Total	17,005

In regard to Ukumehame and Olowalu, it may here be noted that the existing leases were cancelled a year or more ago in order to permit the sale of certain portions of the makai lands. The area above the land sold is therefore now in such case that such part of it as comes within the forest reserve boundary can be definitely set apart at once.

Across Ukumahame the reserve line was drawn at a considerably higher elevation than elsewhere on the mountain. This is done advisedly because between the Ukumahame gulch and the gulch just north of the Waikapu-Ukumehame boundary is a high, broad-topped ridge of open grazing land, without trees. The forest reserve line is drawn along the top of the precipitious and impassible palis on either side and across the shoulder of this ridge so as to include in the reserve all the existing forest. As there are no springs on this section of Ukumehame and as, being at the leeward end of the mountain, the dependable drainage from it is practically nothing, the section below the line can be left out of the reserve without detriment to the Ukumehame stream, and continue to serve a useful purpose as grazing land. The right to use a small reservoir just within the forest reserve boundary, built by the former lessees of the land to collect surface water, should be included in the grazing lease. In the re-leasing of this land, provision should be made for fencing the forest line between the gulches, as one of the terms of the lease.

Fencing.

Owing to the fact that on the lands controlled by the Wailuku Sugar Company and the Olowalu Plantation, cattle are no longer

grazed between the cane fields and the reserve boundary, the necessity for fencing these sections of the forest line is obviated. Similarly, behind Lahaina only a few head of plantation stock, work animals and the like, are pastured and these only in fenced enclosures. In Kaanapali, the fence of the private forest reserve of the Honolua Ranch shuts cattle off from the mountain, while elsewhere, with the exception of a few comparatively short stretches, the greater part of the forest line follows natural barriers. Provided the existing fences are maintained, the forest on the mountain will be as well protected as can be expected till the Government is in a position to lend a hand in such work. It is the expressed intention of the private interests involved to keep the existing fences in good condition. Therefore, for the present, the reserve boundary may be regarded as provided for.

In view of the statement just made, it may not be amiss to call attention to the fact that the present situation of the Government in regard to fencing forest reserve lines is one that ought to be improved. In many instances, were this Department able to fence short stretches across Government land, the adjoining private owners would be willing to continue the line. At the next session of the Legislature, an effort should be made to secure a specific appropriation for this purpose.

Goats.

In parts of the proposed reserve are bands of wild goats that are doing serious damage to the forest. Every reasonable method of getting rid of these pests should be encouraged and as soon as it is financially possible, systematic hunting to exterminate them should be begun. Fortunately, the West Maui Forest is relatively free from other sources of injury.

The Forest.

It is not within the province of this report to discuss the character of the forest on the West Maui Mountain. Its object is to deal with the exterior boundaries rather than in detail with the forest within. But it may be noted in passing that Hillebrand speaks of the swampy area at the summit of Mount Eke as being botanically one of the most notable spots in the islands.

Except for a few open places on the lower slopes, near the boundary line, the whole top of the mountain is covered with a heavy cover of vegetation. Trees, creepers, undergrowth, ferns and mosses cover the steep ridges and make climbing almost impossible outside of the few and scattered trails. It is withal a cover admirably adapted for a protection forest. The reserve should be so managed as to insure its being kept intact.

PRIVATE RESERVES.

For a number of years the greater part of the area, now proposed to be set apart, has actually been treated as a forest reserve,

for the sections above their several plantations have been kept fenced, respectively by the Pioneer Mill Company, the Wailuku Sugar Company, the Olowalu Company and the Honolua Ranch. The formal creation of a reserve recognizes these private reserves and gives to them, as it were, the stamp of official approval.

THE BOUNDARY.

The line laid out as the boundary of the proposed West Maui Forest Reserve runs from one to another of the principal topographic points above the limit of agricultural land, being so drawn as to exclude all land that is at present under cultivation or that is likely to be needed for agricultural use. The agricultural land in the valleys is excluded from the reserve by an exception clause in the description.

The elevation of the line varies with locality. Behind Lahaina it is in the neighborhood of 2000 feet. Along the foot of the steep slopes back of Olowalu it drops to about 1000 feet. Over the shoulder of the mountain, above McGregor's Landing, across the land of Ukumehame, as has already been noted, it rises to about 3000 feet. Back of the Wailuku Plantation from Waikapu to Waihee it averages from 1200 to 1500 feet, while through Kaanapali the line varies in elevation from 1000 to 2000 feet.

At all the principal stations along the line forest reserve monuments have been erected to mark permanently the points on the ground. Permission to erect these monuments, where they happen to stand on privately owned land, was granted by each of the plantation companies, with the understanding that the government thereby in no way acquired any right or title to the area defined. The purpose of the monuments is to show clearly on the ground, just where the line is, so that there may be no misunderstanding as to what constitutes the limits of the reserve.

RECOMMENDATIONS.

On the basis of the facts above set forth, I now recommend that the Board request the Governor to create at the West Maui that the Board requests the Governor to create as the West Maui Forest Reserve the area within the boundary hereinafter technically described and to set apart as portions thereof, after the hearing required by law, the parts of the government lands within the reserve boundary: the included portions of Ukumehame, Olowalu and Puuiki, being unleased, to be definitely set apart at once; the other government lands, being now under lease, to be set apart subject to the existing leases, as provided by the amendment to Chapter 28 of the Revised Laws, made by Act 4 of the Session Laws of 1907.

DESCRIPTION.

Following is the official description prepared by the Government Survey Office: (C. S. F. 1854.)

West Maui Forest Reserve.

Including portions of the ahupuaas of Ukumehame, Olowalu, Launiupoko, Puehuehu, Kauaula, Kuia, Panaewa, Paunau, Kuholilea, Halakaa, Wahikuli, and Hanakaoo, in the district of Lahaina; portions of the ahupuaas of Honokowai, Mahinahina, Kahana, Mailepai, Alaeloa, Honokahua, Honolua, Honokohau, and Kahakuloa, in the district of Kaanapali; and portions of the ahupuaas of Waihee, the ilis of Kou and Hananui, the ahupuaas of Waiehu, Wailuku and Waikapu, in the district of Wailuku, Island of Maui.

[The technical part of the description is here omitted as it also forms a part of the official proclamation that will later be published in full.]

AREAS.

In Lahaina District.

	Acres.
Ukumehame and Olowalu—Government....	7,655
Launiupoko	1,455
Puehuehu	440
Kauaula	1,455
Kuia, Panaewa and Paunau (Lahainaluna School Land)	2,100
Paunau	210
Kuholilea	120
Halakaa	255
Wahikuli—Government	1,550
Hanakaoo	720
Puuiki—Government	205

In Kaanapali District.

Honokowai—Government	1,410
Kahana and Mahinahina	330
Mailepai	120
Alaeloa	30
Honokahua, Honolua and Honokohau......	5.720
Kahakuloa—Government	5,900

In Wailuku District.

Waihee	4,220
Kou-Government	285

Hananui	200
Waiehu	1,190
Wailuku	4,935
Waikapu	3,935
Total Area of Forest Reserve	44,440

Excepting from this Reserve the bottom lands that are now and that may hereafter be used for house lots, agricultural purposes and water development in the valleys of the Government lands of Ukumehame, Olowalu, Paunau (Kanaha Valley), Honokowai and Kahakuloa, and in the valleys of the privately owned lands of Waihee, Wailuku, Waikapu and Kauaula, namely the Waihee, Iao, Waikapu and Kauaula Valleys.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

WAIAHA SPRING FOREST RESERVE.

RESOLUTION RELATING TO THE PROPOSED WAIAHA SPRING FOREST RESERVE.

Resolved, that those certain lands in the District of Kona, Island of Hawaii, bounded in general terms as follows:

Lying on the southwestern slope of Mt. Hualalai, bounded on the north by the land of Puaa I and on the south by the land of Kahului II, between the elevations of 2300 and 3000 feet, and containing an area of 193 acres, more or less, as recommended in a report of the Committee on Forestry, dated January 15, 1908, based on a report of the Superintendent of Forestry, dated December 30, 1907, which reports are on file in the office of the Board of Agriculture and Forestry; the boundaries of which proposed reservation more particularly appear by and on a map made in December, 1907, by the Hawaiian Government Survey Department, which said map is now on file in the said Survey Department, marked "Registered Map No. 2379," and "Waiaha Spring Forest Reserve"; and a description accompanying the same, numbered C. S. F. 1855, which said description is now on file in the said Survey Department; copies of which said map and description are now on file in the office of this Board and made a part hereof; be approved as a forest reserve to be called the Waiaha Spring Forest Reserve.

Resolved, that the Board recommends to the Governor that the government lands lying within the boundaries of the said proposed Waiaha Spring Forest Reserve be set apart by him, subject

to vested rights therein, after the hearing required by law, as the Waiaha Spring Forest Reserve.

Adopted at a meeting of the Board of Agriculture and Forestry held on January 15, 1908.

REPORT OF COMMITTEE ON FORESTRY.

To the Board of Comissioners of Agriculture and Forestry:

At a meeting of your Committee on Forestry, held Tuesday, January 14, 1908, at 10 a. m., at the office of the Chairman in the Judd Building, the following recommendations were unanimously agreed upon:

WAIAHA SPRING FOREST RESERVE.

Your Committee recommends that the Board take favorable action on the report of the Superintendent of Forestry, dated December 30th, 1907, in reference to the Waiaha Spring Forest Reserve and that the Board establish this small reserve of about 193 acres for the protection of the water hole there.

Respectfully submitted,

G. R. CARTER, *Chairman*,
W. M. GIFFARD,
C. S. HOLLOWAY,
Forestry Committee,

Dated Honolulu, January 15, 1908.

The foregoing report was approved by the Board and ordered placed on file at the meeting held on January 15, 1908.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

Honolulu, December 30, 1907.

Committee on Forestry,
Board of Agriculture and Forestry,
Honolulu.

Gentlemen:

I have the honor to submit the following report, with recommendations, on the question of reserving a block of forest around the Waiaha water hole on the land known as Waiaha Lots, North Kona, Hawaii.

The report is made in answer to communications to the Board from Mr. J. W. Pratt, Commissioner of Public Lands, and from

Mr. F. B. McStocker, under the dates, respectively, of October 11, 1906, and October 18, 1906. It is based on a personal examination of the locality made by me during a visit to Kona in September, 1907.

The Waiaha Lots consist of a roughly triangular remnant of Government land lying between the privately owned lands of Kahului 2 and Puaa 1, between the elevations of 2300 and 3000 feet, and containing a little less than 200 acres. Waiaha is separated from other Government land, the nearest being Honuaula, the next land but one on the north, a section of the upper part of which has been set apart as the Honuaula Forest Reserve. To the south there is no other Government land for a long way.

The Waiaha Lots were surveyed and laid out in September, 1906, with the expectation of selling them as homesteads. But when the map was ready it developed that there was a water hole on the land and that some of the rest of it, being swampy was perhaps water-bearing. The advice of this Board was accordingly requested by the Commissioner of Public Lands as to the best disposition of the area. After several unavoidable delays, I was able to visit the land in September last and have now to report on it.

Before discussing in detail this particular water hole it may be well briefly to consider the general subject of the water supply of North Kona. In this statement the term "spring" will be used to mean a source of constantly flowing water; "water hole," a place where water collects, more or less intermittently, from surface drainage, from seepage, or from the percolation of ground water from sources near by or remote.

With the exception of a few scattered springs and a few more water holes, the Kona District has no regular natural supply of continually available water. There are, in fact, no permanently running streams around the south and west sides of Hawaii from Hilo to Kohala. The few stream-beds that do exist in Kona—hardly more than a half dozen all told—only carry water for a few hours during times of rain. At such times, however, they run full, often doing damage where they are crossed by roads or where they pass through cultivated fields. From a few of the springs pipes lead the water down to the Government Road, where it is used for domestic supply, stock watering, etc. Most of the water for domestic supply in Kona is, however, rain water, caught on roofs and held in cisterns.

With so limited a supply it is evident that what natural sources of water there are ought to be carefully safeguarded and made to do their full duty. To this end I believe that all the known springs and water holes in Kona should be set apart as water reserves, preferably surrounded in each instance by a block of forest of such size as may be needed adequately to protect the water head. Particularly is this the case where a water hole is supplied in part, or altogether, from surface drainage and in places where

loss through evaporation can be checked by surrounding vegetation.

This recommendation applies to springs and water holes on private as well as on Government land and will be made to each of the private owners in Kona who have applied to this Department for advice on the management of their forest tracts.

The Waiaha water hole is one of the most important water holes in Kona, so much so that it was at one time proposed to set it apart as an official water head, somewhat after the manner of Polipoli Spring on Maui. It is stated that during dry times many persons come to Waiaha to water stock and even to get water for domestic use. It is further said that at such times when several dozen head of stock are watered at night and the supply exhausted, by morning the water hole has again filled.

The supply seems to be wholly from percolation, but whether the water comes from a distant source or is the result of local drainage is not known. But from the character of the surrounding lots, which contain boggy spots and one or two small, intermittent brooks it may safely be assumed that most of the supply comes from near by.

The elevation of the Waiaha Lots and their distance from the main road reduces their value as homesteads that could be made to pay. It is true that the adjoining lots makai were at one time planted in cane, although only one or two crops were raised. Should it again appear desirable to grow cane at this elevation it would doubtless be possible to do so on Lots 6 and 7 as well, were the land cleared. But because a thing is possible it does not necessarily follow that it is wise. At present there is no demand for the land for cane. Of the other crops that could be raised by the homesteader, Irish potatoes sceems the most likely.

On the other hand it would seem that the water on the Waiaha Lots, if developed and properly handled, could be made an asset of considerable value to the Government, sufficient indeed to justify the use of the land for this purpose.

At present the Waiaha Lots, Numbers 6 to 10, are covered with forest, in which Ohia Lehua, Koa, Opiko and other trees make up a fairly dense stand. The trees are generally in healthy condition, but the undergrowth has been much opened up by cattle and unless protected will soon disappear altogether. Existing fences in part protect the lots from cattle, but only in part. If made a reserve the entire area should be enclosed by a suitable fence. There is, unfortunately, no money now available for fencing, but as this is a defect likely to be remedied in the near future it should not interfere with the carrying out of the project.

The following extracts from the report of the Assistant Surveyor who laid out the lots, Mr. G. F. Wright, further describe the area:

"The land is a series of rises and flats, the latter being patched a great deal with small swamps. The water collects in these flats and works its way out in small streamlets until it strikes the next flat where it disappears and again works its way out, and so on down; but as far as I could see, none of the water went much below Puaa Trig. Station (marked on plan).

"You will notice running through lots 7 and 8, two small streams; there are a few more scattered over the lots, but as it was impossible to make the lots conform to the stream lines, I just located the two main ones.

"The streams, as a rule, have quite a little standing water in them, but very little running water.

"In lot 6, I have reserved a 0.25 acre piece. There are two water holes which seem to be connected by an underground channel; from information gathered from a ranchman it seems the water holes never go dry, and during the last dry season it was used a great deal.

"Water undoubtedly could be developed at Waiaha, to what extent I could not say, and if such is the Government's intention, it would be advisable to fence in and set aside Waiaha as a water reserve, for if the lots are opened up, and cattle let run on them, the forest will begin to go and with the forest will go the water."

In view of the facts above set forth and also because of the example to the owners of other springs, I believe that the Government should set apart the remaining Waiaha lots as a reservation.

While the main object of the forest reserve system is to protect the sources of water, it is somewhat of a departure to create small reserves detached from the main body of the forest. But in view of the problems that at once arise in regard to care and administration it would appear that the most efficient way of handling such areas under the organization of the Territory, would be as forest reserves.

I therefore recommend that the Waiaha Lots Nos. 6 to 10 be reserved and set apart as the Waiaha Spring Forest Reserve.

[Here follows in the original a technical description of the area, furnished by the Government Survey Office as C. S. F. No. 1855. It is here omitted as it also forms a part of the official proclamation that will later be published in full.]

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

THE HAWAIIAN

FORESTER AND AGRICULTURIST

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NEW NITROGEN FERTILIZERS.

By L. G. Blackman.

The principal constituents of plant food are present in greater or less proportion in most soils. As the latter are formed by the disintegrating and general weathering process of rocks, the composition of a particular soil is dependent to a great extent upon the nature of the rock from which it has been derived. Intermingled with the inorganic decomposed rock there is present in every fertile soil a variable proportion of decomposed organic matter, the accumulation of former generations of animal and vegetable growths. It is the latter ingredient, termed "humus," which gives a soil much of its agricultural value and upon which to a great extent plants feed, for vegetation, as well as animals, is incapable of supportly life directly from inorganic substances alone.

In a natural state the earth's successive growths of vegetation contribute to the accumulation of the soil's humus. Each generation returns to the earth an added deposit of matter in a form readily available as plant food. The continual cultivation of crops and their removal from the soil by man, however, depletes the soil of much of its valuable plant food, and this process being continued, a time is soon reached when the land becomes so exhausted that it cannot be profitably cultivated without artificial reinforcement.

In order that a plant may grow to advantage it is of prime importance that a sufficient supply of all the elements of its food be present in an assimilable form. At times, although such elements are contained in the soil, they are locked up in some chemical combination with other elements, which renders them unavailable by vegetation. Speaking broadly, the main necessary food of plants may be said to be Carbon, Hydrogen, Oxygen and Nitrogen, and in less degree Potash, Lime, Magnesia and Phosphoric Acid.

The four latter foods (being the ingredients of the primitive rock) are abundant in most soils, and as the supply of Carbon, Hydrogen and Oxygen is usually fully provided for by means of rain and the atmosphere, the chief question affecting the well being of a plant, once the soil has been depleted of its natural humus, is a supply of available Nitrogen. This element constitutes the chief bulk of our atmosphere, but plants are unable to assimilate it in a free state, that is, unless it is first [1] chemically combined with another element. Although surrounded by an inexhaustible supply of this necessary food, vegetation therefore will languish and die unless some means is at hand to render it available. This is generally accomplished by the chemical combination of Nitrogen with Hydrogen in the form of Ammonia, or with Potash or Soda in the form of one of the well known "Nitrates," so largely employed as artificial fertilizers.

Nitrogen is a necessary constituent of every organic body. Although it plays so important a part in the composition of living matter and exists in such inexhaustible quantity in the atmosphere, the free Nitrogen of the air is not drawn upon for plant and animal food because it possesses the property of refusing, under most circumstances, to combine with other substances. This peculiarity of Nitrogen is remarkable when we consider the readiness with which some other elements combine with one another as seen, for instance, in the case of Oxygen. The slow combination of this latter gas with some metals is exemplified in the corrosion or rust of iron and in the tarnishing of silver. The more rapid and energetic combination of Oxygen with other substances, produces, as is well known, the phenomenon of fire.

So noteworthy is the inertness of Nitrogen, that Lavoisier, the eminent French chemist, in reference to this quality termed it Azote, a name signifying "without life," and which is still in general use by the French. On account of this property the element was long regarded as a more or less useless gas whose chief function lay in diluting the atmospheric Oxygen and thus rendering it suitable for animal respiration.

How comes it then, in view of the refusal of Nitrogen to enter into combinations with other elements, that this element, so extremely insoluble in water, plays such an important part in the economy of plant life? What subtle force is at work which overcomes its inert quality and renders it suitable for absorption

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[1] The distinction between a mechanical and a chemical mixture is most important. In a mechanical mixture the ingredients are simply mixed together and no new body is formed, while in a chemical mixture an entirely new body is produced. The mechanical mixture of Hydrogen and Oxygen is an invisible gas, but their chemical mixture produces water. In the air, Oxygen and Nitrogen are mixed mechanically, while if they were in chemical combination they would produce suffocating ammonia and nitric acid gases in which nothing now living could exist.

into the system of the plant? The extreme insolubility of Nitrogen shows that the agency of water is not accountable for the absorption of this element even when it is remembered that in order to produce one pound of dry vegetation the enormous quantity of four hundred pounds of water is necessary.[2]

In order to satisfy the difficult question of the assimilation of Nitrogen by plants, many theories have at times been considered. Of these, digestion by means of the sap juice cannot be held to be the cause of the absorption of insoluble elements, for such a process would necessitate the 'breaking up' of Nitrogen into an assimilable form—a process at variance with the eminently constructive function of sap. It is now, however, generally held that the appropriation of Nitrogen by vegetation is due to the agency of bacteria, which infest all fertile soils and exist upon most plants. By means of these minute organisms, the insoluble Nitrogen is, as it were, decomposed or predigested, and rendered assimilable as plant food.

In the sequence of vegetation growing upon soil undergoing the process of weathering from primitive rocks, until late years, the lichens were considered as appearing first. The action of these simple structures after many generations prepared the way for mosses, which again rendered conditions suitable for plants of a higher order. It is now known, however, that preceding the lichens are the minute bacteria to which reference has been made, whose function is to render the inorganic constituents of the soil capable of supporting plant food. The origin of the bacteria themselves is a more profound question, which has not been solved, but their presence to the agriculturist appears to be as necessary as the working of the yeast plant is to the brewer.

This renders the distinction between a sterile and a fertile soil better understood, for of two soils almost similar in chemical and physical characteristics, one may be extremely fertile and the other non-productive. The question of the presence of suitable bacteria in a soil is therefore a very important one, and ranks equally with those affecting its chemical constituents and physical properties.

The action of the beneficial organisms referred to, as regards their function of supplying plant nutrition is principally confined to the nitrogenous matter already in the soil, although these organisms may possess to a small degree the power of tapping the air reservoir itself and obtaining a supply of Nitrogen direct therefrom.

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[2] The same problems affect the absorption by the plant of the extremely insoluble elements, phosphorus and silicia. The latter element, inert alike to the action of water and all acids (except hydrofluoric) is first 'broken up' and rendered assimilable by the plant root and then reconverted within the system of some plants where it exists as minute crystals.

The conversion of the nitrogenous constituents of the soil into nitrates assimilable by plants is known as nitrification. In order to bring about this little understood process three conditions are necessary, viz: the presence of bacteria, a supply of Oxygen, and a salifiable base such as Lime, Soda, or Potash. Nitrification takes place under favorable circumstances in all fertile soils, and as the bacteria are most active at a temperature of from 75 to 100 degrees, F., it is between these thermal points, that plant growth is most vigorous. At temperatures much below that indicated the work of the bacteria is retarded and at a certain degree of coldness their operation ceases. The economic use, from the point of plant life of these beneficial organisms, therefore, is their conversion of the nitrogenous organic matter and ammonia compounds of the soil and, to a less extent of the air, into soluble plant food. This is effected by combination with such bases as Lime and Potash with which Nitrates are formed. From these latter compounds plants derive most of their nitrogen, and in order to support plant life, it is necessary that such soluble nitrates be present.

When the natural supply of nitrates in the soil becomes exhausted, it is necessary that these be renewed artificially. This opens up the important subject of plant fertilization, which is every year forcing itself more and more to the notice of agriculturists.[3] As the available supply of nitrates is restricted, the question of the continued fertilization of the soil is an exceedingly urgent one. With regard to the supply of animal manure, (the use of which as a supply of plant nitrogen has obtained in all ages, although it is only during the last century that the reason of its beneficial action was understood) the production is diminishing rather than increasing. Moreover with more enlightened knowledge of hygiene, even if this fertilizer were to become available in sufficient quantities, it is questionable whether for this reason alone its general use for agricultural crops would be adopted.

Among the nitrogenous chemical manures, Sulphate of Ammonia is important. This fertilizer is produced by the destructive distillation of coal and shale, and is a by-product in the manufacture of gas. Although its manufacture is extending it

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[3] An additional vagary on the part of the element Nitrogen also tends to emphasize the importance of the diminishing available supply of this important vegetable food, for it does not follow the natural cycle pursued by most other substances in their appropriation by the organic world. As a rule the constituents of the primitive rocks crumble into soil and after assimilation by vegetables and animals are returned again to the soil. With regard to Nitrogen, however, such a cycle is not completed, for this element, instead of returning to the soil passes off into the atmosphere. There is therefore a continual process in operation for the liberaton of Nitrogen from combination with other elements, and each generation of life depletes the earth of its supply and diminishes the potentiality of our planet for sustaining organic life.

must always be quite insufficient to meet the demand of the agriculturists.

The main supply of Nitrogen for fertilization is at present chiefly obtained from natural deposits of Nitrates which occur in certain countries. With respect to this source of plant nitrogen also, the available quantity is limited and in view of the enormous extension of cultivated areas demanding scientific fertilization, the day is not distant when the output of this fertilizer will decrease and will ultimately become exhausted. Of these fertilizers the two best known are the nitrates of Potash and Soda. Both of these are found in considerable natural deposits, the former in India and Persia, and the latter in Chili. Nitrate of Soda, is known as Chili Saltpeter, and is used very extensively in agriculture. It is also largely used in the manufacture of Nitric Acid and of other chemicals, for as has been said, the extreme inertness of the free gas Nitrogen, has caused the naturally existing supply of the world's nitrates to be resorted to for the formation of many new nitrogenous combinations. In this way the available deposits are being rapidly exhausted and in order to insure the continued prosperity of many agricultural crops, it is imperative that a new supply of nitrates be forthcoming. Where then, when the natural deposits have disappeared, will agriculturists turn for their new supply of nitrogen fertilizers? The most ready means of satisfying this demand which suggests itself, is to tap the great air reservoir of its Nitrogen, and then to discover some way of combining it chemically with suitable substances.

The atmosphere may be described as a aerial ocean surrounding the earth. From the time of Aristotle until less than one hundred and fifty years ago it was regarded as one of the four elements. It is now known to consist almost entirely of a *mechanical* mixture of the two gases Nitrogen and Oxygen, in the proportion of about four volumes of the former to one of the latter. A graphic representation of this proportion may be had by inscribing a circle within a square. In such a figure the circle will represent the Nitrogen present in the atmosphere and the four spaces at the corners of the square, the Oxygen.

Besides the Nitrogen contained in the atmosphere in mechanical mixture with Oxygen, there are also present traces of Nitrogen in chemical mixture with Hydrogen, and also with Hydrogen and Oxygen together. Of these latter compounds Ammonia ($N\ H_3$) and Nitric Acid ($H.\ N.\ O_3$) are the most important to plant life, but they occur in infinitesimal amounts, varying accordingly to local and meteorological conditions.

The presence of Ammonia in the atmosphere is chiefly due to the decomposition of organic matter. The precipitation of rain brings with it small quantities of this compound which is thus rendered available for plant use. The occurrence of electrical disturbances in the air produces Nitric Acid and in India, where

the soil has been depleted for countless generations of cultivators, the crops are dependent upon the periodical monsoon for their supply of nitrogen.

The insulation of Nitrogen from the atmosphere is a very simple operation. A well known method is by igniting Phosphorous in a receptacle containing atmospheric air. The combustion of the Phosphorous exhausts the Oxygen present and when the burning ceases the resultant gas consists of Nitrogen in a fairly pure condition. Another method of obtaining this gas is to pass a stream of dry air through turnings of red hot copper. The Oxygen of the air remains behind and forms oxide of copper, while the nitrogen passes away alone.

During the last few years a very material advance has been made in the discovery of practical methods to combine Nitrogen with other elements on a commercial scale. For this purpose there are already several factories in Europe and the United States engaged in the manufacture of nitrogen compounds for agricultural purposes. As yet this newest and in some ways most remarkable of the scientific industries, is in its infancy, but it has already passed beyond the realms of experiment and is engaging more and more the attention of capitalists. The chief obstacle at present which the manufacturer of Nitrogen compounds has to face is found in the cost of the new product. Although this can be marketed at a price below the cost of Chili Saltpeter and similar fertilizers, the margin of profit is as yet not sufficiently great to attract the notice of those who are looking for an investment to yield an extraordinary return. In this, as in all new enterprises, those who will benefit most are the manufacturers first in the field, for in spite of the present conservative profits to be derived, the methods of manufacture of the new products are already being cheapened and improved. This, taken into conjunction with the undoubted facts that the natural supply of nitrogen compounds is diminishing, and the demands of agriculture are increasing to an unprecedented extent, renders it certain that the factories which now take control of the supply of artificial nitrogen fertilizers, will in a very short time be placed in a most advantageous position.

CALCIUM CYANAMIDE.

The manufacture of the new fertilizer, Calcium Cyanamide, is conducted according to the Frank and Caro method, an electro-metallurgical process, the Europe rights of which are held by the Società Generale de la Cianamide, of Rome, Italy. Already many subsidiary companies are in operation, chiefly in Italy, France, Norway and Switzerland, which are conducted on a profit sharing basis in conjunction with the general company. The manufacture of Calcium Cyanamide is performed on the principal that Calcium Carbide absorbs Nitrogen when heated

to a sufficiently high temperature. The Calcium Carbide is first produced in the usual manner by heating lime and coke to a temperature of 2500 degrees Centigrade in electric furnaces of the resistance type. The carbide is then heated in retorts, and at 1100 degrees (C.), atmospheric nitrogen is introduced and absorbed, the new compound being known as Calcium Cyanamide.

The first plant erected for the manufacture of Calcium Cyanamide was at Piano d'Orta, Italy, in 1905. In this factory were installed six furnaces, each with five retorts for the absorption of Nitrogen by the Carbide. Each retort works off three charges daily, consisting of 100 kilograms (2200 lbs.). The absorption of Nitrogen by the Carbide increases the weight materially, and from each charge 125 kilograms (275 lbs.) of Calcium Cyanamide is obtained. The plant has, therefore, an annual capacity for the conversion of 3000 tons of carbide into 3750 tons of Cyanamide. This factory is operated by water power, supplied by an independent company. The generating station, where a head of 90 feet, supplying 8400 h. p., is available, is more than six miles from the cyanamide plant, to which the power is transmitted at 6000 volts. The factory has proved so successful that already an extension to an annual 10,000 tons capacity is in progress, and other similar plants are projected throughout the country.

In France, the Sociétè Française des Produits Azotes is already in operation and another in Savoy has an annual output of 3750 tons. In Germany and England the Frank and Caro process is also being actively operated, and in the United States the American Cyanamide Company of Alabama will have an annual capacity of 20,000 tons.

The method is already being improved and the chemist, Polzeniusz, has discovered an important modification in the manufacture of Cyanamide. This is brought about by the addition of Fluor-spar to the carbide which facilitates the absorption of Nitrogen at the comparatively low temperature of 400 degrees (C.) and, moreover, produces a product which does not so readily become moist. The market price of Cyanamide is at present regulated by the price of the two competing artificial manures, ammonium sulphate and nitrate of soda. Its actual cost of production has been found in Germany to average about $40 per ton, which has been marketed at a little over $50. This has been achieved in cases where cheap water power was available, but as the process improves, the rival fertilizers, will without doubt, be eventually driven from the market by this and similar new products.

CALCIUM NITRATE.

Another noteworthy new artificial fertilizer, Calcium Nitrate, is manufactured by the Birkeland and Eyde process, at Notodden,

in Norway. This product is obtained on the principal that at the extreme heat of 3000 degrees, Centrigrade, atmospheric Nitrogen can be made to directly combine with Oxygen. Although this fact has long been known, the intense temperature required has been against the general adoption of the process, but by the use of the electric arc flame it is now operated on a large scale. The chemical combination of Nitrogen and Oxygen thus achieved produces Nitric Acid gas. This compound is afterwards passed through absorption towers through which water and milk of lime flow. The resulting liquid obtained is then evaporated and solid Nitrate of Lime (calcium nitrate) is obtained.

The Notodden plant was established in 1903. It possesses three furnaces ,each producing 250 tons of nitric acid per annum, which yield about 325 tons of calcium nitrate. The factory therefore turns out approximately one thousand tons of fertilizer per year, but another plant of twenty times this capacity is soon to be erected. Licenses for the Birkeland and Eyde process are granted by the Aktieselskabet Notodden Salpeterfabrik, Christiania, Sweden. Many plants are at work in Europe on the manufacture of Calcium Nitrate by this patent, although Norway is more forward in this respect than other countries. At Rjukanfos, a factory is being constructed where 250,000 h. p. is available from water power.

In the Birkeland and Eyde process, also, a great improvement has lately been introduced by which the percentage of Nitrogen is increased and the hygroscopic properties of the product is reduced.

In the Hawaiian Islands there is without doubt a splendid opportunity for the manufacture of either Calcium Cyanamide or Calcium Nitrate. The enormous and growing quantity of fertilizers required by the cane fields, the anticipated reduction of the output of natural nitrogenous compounds, and many other circumstances hold out to the manufacturer of the new products a most promising investment. The available water supply of the Kauai mountains naturally would suggest that island as the most appropriate site for such an enterprise, although there are without doubt throughout the islands other available sources of water power. In the near future we predict the introduction to the Hawaiian Islands of one of the processes briefly described and we hope that such an undertaking will be prosecuted with Hawaiian capital.

The following letter from the United States Department of Agriculture was recently elicited in response to a request by a correspondent in the Islands who desired information on this subject:

United States Department of Agriculture,
Office of Experiment Stations,
Washington, D. C.

March 26, 1908.

Dear Sir: Your letter of February 29, asking information regarding the manufacture and use of calcium nitrate and calcium cyanamid, has been referred to this office for reply.

The Department has not yet investigated the fertilizing value of these materials, but from the large number of reports of foreign investigations which have been reviewed in this office it seems safe to say that the basic calcium nitrate prepared by the Birkeland and Eyde process is a very valuable fertilizer, fully equal, and in some cases superior to nitrate of soda, particularly on soils benefited by lime as well as nitrate. The results of investigations with regard to calcium cyanamid or lime nitrogen are, however, not so conclusive. There are certain facts relating to the properties and changes which this material undergoes in the soil which have not yet been thoroughly investigated, but which have important bearing upon its fertilizing value. As far as I can learn neither of the products is yet upon the market as staple fertilizing materials. The processes of manufacture, I believe, are all fully covered by patents both in this country and abroad, but exact information on this point can only be obtained by applying to the U. S. Commissioner of Patents.

Very truly yours,

A. C. True,

Director.

SEED CANE IN THE BARBADOES.

The Forester is in receipt of a few copies for distribution of the publication entitled 'Seedling Canes and Manurial Experiments at Barbadoes, 1905-7,' issued by the Imperial Department of Agriculture for the West Indies. The pamphlet contains a summary of the experimental work during the season under review, carried on upon fourteen estates situated in representative localities of the islands. Seedling canes to the number of 4,874 were planted in 1905, and of these 118 varieties have been selected for replanting. At the end of 1906 only 219 seedlings were obtained, and these are now under observation. Five canes produced by artificial hybridization are under experimental cultivation and further work in this connection is being continued. Considerable areas are now planted for the purpose of producing hybrid canes, both by artificial and natural methods. It is anticipated that future work of this kind will lead to valuable results. A copy of the pamphlet referred to will be forwarded to any one who is interested in the subject.

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

DIVISION OF FORESTRY.

ROUTINE REPORT.

Honolulu, Hawaii, April 1, 1908.

Board of Commissioners of
Agriculture and Forestry,
Honolulu, Hawaii.

Gentlemen :—

I have the honor to submit the following report of the Division of Forestry for the period from February 12 to date. During this time I have been for the most part in the Honolulu office engaged with the preparation of the reports desired by the Board on forest matters and the existing homestead situation in the District of Hamakua, Island of Hawaii, with matters connected with proposed Forest Reserves on the West Maui Mountain, on the land of Makawao, Maui, and in North Kona, Hawaii, with a report to the Bishop Estate on the management of its forest lands in Kona, prepared under the offer of coöperative assistance the result of field work done last autumn, and with two lectures delivered in the popular course at the College of Agriculture and Mechanic Arts on March 27 and 31, 1908.

On February 24 a Public Hearing was held by the Governor and the Board to consider the Forest Reserve Projects just mentioned. No opposition developed, but proclamations have not yet been signed owing to a technicality in the forest law on which the Governor desires to obtain an opinion from the Supreme Court.

Mr. Haughs' report tells of the matters that come under his immediate jurisdiction.

Attention is called to a number of valuable accessions to the Board Library, recently received.

MEETINGS.

On March 9, 1908, the Hawaiian Poultry Association held a meeting in the Library room of the Board.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

THE FOREST SITUATION IN HAMAKUA.

Whenever a forest reserve is made in Hawaii it is the custom of the Board of Agriculture and Forestry to publish in full in this magazine the various reports, recommendations and resolutions in regard thereto. This is done that the public may know the grounds on which the reserve is made and the reasons that underlie the recommendations made.

After a careful and thorough investigation of the problem, the Superintendent of Forestry has reported adversely on the proposition to create a general forest reserve in the District of Hamakua, Island of Hawaii. This report contains a statement of facts, on which rest the reasons for the position taken.

Here follow the reports of the Committee on Forestry and of the Superintendent of Forestry:

REPORT OF COMMITTEE ON FORESTRY.

In view of Mr. Hosmer's report on the question of forestry in the Hamakua District, Hawaii, the *majority* of your Committee recommends that the Board take no action at the present time in establishing forest lines in this district and that the Board approve the proposition of a lease to the Kukaiau Plantation Company of the Government lands of Kaohe, Hoea-Kaao, Kealakaha-Niupea, and Manowaialee.

Providing such lease is made by the Commissioner of Public Lands, the entire Committee recommends that the lease contain the following terms and conditions:

(a) That the term of the lease be such as to expire at the same time as the leases of similar lands in the Hamakua District made some time ago to the Parker Ranch Company.

(b) That the lease require the planting of a minimum of 50,000 trees each year for a period of eight years, and that the lives of these trees be maintained for the entire period of the lease so that at its termination there will be 400,000 growing trees in addition to those now existing. Should any of the trees fail to thrive, additional trees to be planted to meet the required number of 400,000 to be growing at the expiration of the lease.

(c) That the general plan of planting and fencing the proposed groves be subject to the approval and enforced under the direction of the Board of Agriculture and Forestry.

(d) That a good and sufficient bond be required of the lessee to insure the fulfillment of these conditions of the lease.

The report submitted by the Committee on Forestry was approved by the Board of Commissioners of Agriculture and Forestry at a meeting held on April 1, 1908.

REPORT OF THE SUPFRINTENDENT OF FORESTRY.

Honolulu, Hawaii, Feb. 21, 1908.

Committee on Forestry,

Board of Agriculture and Forestry,

Honolulu, Hawaii.

Gentlemen:—

For some time there has been before the Board the question of a forest reserve in the District of Hamakua, Island of Hawaii. Various reports * and other recommendations have been considered and in general the matter has received careful attention. But feeling that opportunity should be given for a still further expression of opinion it was voted, at a meeting of the Board held on January 15, 1908, "that the Board of Commissioners of Agriculture and Forestry request the Superintendent of Forestry to visit the Hamakua District at the earliest opportunity and inquire of the owners of the land in said District below the 3000 foot elevation as to whether they are in favor of having a forest reserve above the agricultural lands in the District; if so, what should be the nature of said forest reserve; and that the Superintendent submit his findings, together with his own recommendations in connection therewith to the Forestry Committee."

Pursuant to this action I at once visited Hamakua, being away from Honolulu from January 24, to February 6, 1908. On January 25, a meeting of the managers of the several sugar plantations in Hamakua was held at Honokaa, while during the following week many other persons, residents of Hamakua or those otherwise directly interested in the District, were interviewed. Mr. F. D. Creedon accompanied me as stenographer and took down the statements made. These are submitted as an appendix to this report.

At the request of the Committee on Forestry, as a further part of the investigation, I also made an examination of the present condition of the various homestead tracts in Hamakua. The result of this study will form the subject of another report.

It may be noted here that in this report the term "Hamakua" is used to include only that part of the District lying to the East of Waipio Gulch below the Mamani forest belt on Mauna Kea.

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* Especially two reports by the Superintendent of Forestry; one dated October 31, 1907, concerning the lease proposed by the Kukaiau Plantation Company; the other, dated November 11, 1907, on the proposition to create a general forest reserve in the District. These reports both contain statements of fact, with reasons for the recommendations made therein.

THE FOREST SITUATION IN HAMAKUA.

For the past twenty years the forest situation in Hamakua, including the question of the desirability of a general forest reserve, has received marked attention. Report after report has been submitted, with recommendations numerous and varied. The agitation has resulted in the setting apart and maintenance of private forest reserves of considerable areas of private land, but so far as a general reserve, proclaimed by the Government, is concerned, nothing has been done. On the contrary much forest land has been opened up for homesteads, while other areas formerly under a dense forest cover have come to be considered as grazing land.

The problem that was presented to the Board of Agriculture and Forestry on its organization five years ago and that, in part, still confronts it was and is, not how best to develop a virgin district, but rather what can be done under existing conditions. To clearly understand the situation as it exists today necessitates first a brief statement of facts; following which will come an exposition of the reasons why under present conditions certain recommendations are made.

Present Conditions in Hamakua.

The Forest.

The area in Hamakua now actually under forest is confined to a relatively narrow belt above the cane fields. The lower edge is about 2000 feet in elevation; the upper varies from about 3500 feet at the east end of the District to about 2500 at the west end, although owing to the fact that the slope is more gradual at the west end, the width of the forest belt is fairly uniform throughout, the average width being something less than two miles.

Ownership of the Land.

The forest belt consists of privately owned land, homestead tracts and government lands, the last named for the most part under lease. At the west end of Hamakua two large government lands, Kamoku and Nienie, with some remnants, are under a twenty-one-year lease dating from September 8, 1907, to the Parker Ranch. Portions of these lands come down into the forest belt, as do also two other government lands, Honokaia and Kalopa, which are likewise under lease to the Parker Ranch, until July 1, 1913. At the east end of the District are the government lands of Kaohe, Hoea-Kaao, Kealakaha-Niupea and Manowaialee, not now under lease but for which application has been made by the Kukaiau Plantation Company.

Title to all but a few scattered lots in the homestead tracts has passed from the government, and those that are left are so small in area and so widely separated as not to be of moment for forest reserve purposes, even were it desirable to put them to such use.

The area above what is now the upper edge of the woods, up to the lower edge of the Mamani forest was formerly also under a forest cover, but due to injuries resulting from long continued grazing, followed by the extensive and very destructive forest fires of 1901 the forest at this elevation has now so completely disappeared that ,except in a few restricted localities, to secure a new forest through natural reproduction would be an extremely slow process. Not only are there few seed trees left, but over most of the area is a heavy stand of rank-growing grass, unfavorable to forest reproduction. The greater part of the land above the existing forest at the middle and at the west end of Hamakua is included in the Parker Ranch, either in fee simple or under one of the above mentioned leases. The section covered by the Mamani forest, which extends mauka from an elevation of approximately 4500 feet, does not concern the present discussion, which has to do with the area formerly covered by the original Koa and Ohia forest.

Water Supply.

The chief reason for the creation of forest reserves in the windward districts of Hawaii is the influence the forest cover exerts on the local water supply. In the Hilo Forest Reserve and on the Kohala Mountains the dense forest cover of trees, ferns and undergrowth absorbs the heavy rainfall, prevents rapid run-off and equalizes and maintains the flow in the streams that are so important for use for various purposes below. This is the chief use of these "protection" forests and is wholly apart from any influence a belt of forest may perhaps have on precipitation. For there is no question as to what takes place in the forest after the water reaches the ground.

In Hamakua the conditions controlling stream flow are radically different from those in the Hilo District or on the Kohala Mountains. Between Ookala and Waipio Gulch there are not now, nor so far as I can learn have there been during the last sixty years, any permanently running streams. Even when there was a dense and untouched forest above, the streams are said not to have run continuously—though probably the flow at that time was of longer duration after rains than it is today. Likewise, springs are few and far between; those that are really dependable, *i. e.*, that can be relied on to out-last droughts, being for the most part located away from the forest, near the main Government road. Taken as a whole the soil of Hamakua is

remarkably porous, so that even a heavy rainfall is soon swallowed up and lost.

These facts have too often been lost sight of in discussions of Hamakua, but it is obvious that where the rocks and soil of a district are so pervious as to make stream flow possible only during heavy rains, arguments for the protection of the drainage basin lose their force. In other words, to secure a regular flow there must be an impervious stratum to catch the water and gather it into certain channels, where later it can be turned to account by man. The known facts do not justify the statement that a dense forest cover in Hamakua would have *no* influence on stream flow, but they surely do show that Hamakua is in a very different case from Hilo.

Furthermore, it should be noted that the construction of the Hamakua Ditch, which brings out water from the Kohala Mountains, has materially relieved the water situation in Hamakua, not only by assuring a supply of water for fluming the cane, but also by permitting the irrigation of lands that have heretofore had to depend on rainfall.

Another beneficial influence of a forest cover is that it prevents erosion. In Hamakua the situation where most benefit from such protection would be derived is, unfortunately, in the homestead belt, where the land has already passed into the possession of small individual owners. It is indeed true of the whole question of water shed protection in Hamakua that the lands where it would be of most value are no longer controlled by the Government.

Influence of the Forest on Climate.

One of the strongest arguments for a forest reserve in Hamakua is based on the beneficial influence that a forest belt of sufficient size is supposed to exert on the climate of a district, particularly in regard to inducing precipitation. The gist of the argument is as follows:

To insure rainfall the first requirement is winds bearing moisture-laden clouds. In Hawaii this condition is met by the trade winds. In the Hilo District and on the Kohala Mountains a mountain rises in the path of the clouds; stops them; precipitation ensues; result, a district of heavy rainfall. In Hamakua a different topographic situation prevails. Instead of a mountain mass in the path of the trade wind clouds there is the depression between Mauna Kea and the Kohala Mountains, too low in elevation to stop the moisture-laden clouds, which accordingly pass on to be dissipated over the open, dry plains of Waimea, or to go on out to sea again over Kawaihae Bay. So far a statement of fact. Now, so runs the argument, were there a sufficiently large belt of forest at the northeastern edge of the Waimea, Plains, such as formerly existed between Mana and Mud

Lane, it would often be the case that the low-hanging, moisture-laden clouds, almost at the point of precipitation, would on passing over the cool surface of the forest belt be influenced just enough, the other factors controlling precipitation being present, to cause their contents to be precipitated, to the benefit of the dwellers on the plains beyond and also of those in the district below, for, it is argued, if the clouds were held over the forest a bank would be formed and backed up sufficiently far out over the lower lands to affect the rainfall even on the area below the lower edge of the existing forest.

Except perhaps as to the extent to which the lower lands would be affected this reasoning is sound in theory, for it is an axiom in physics that other conditions being the same condensation (and as a corollary, precipitation) will occur over a cool, moist surface (such as a forest) rather than over a hot, dry one (such as an open plain).

From a careful study of the subject I am inclined to believe that whatever may be true elsewhere, here in Hawaii, under our insular conditions, there are certain localities—of which Hamakua is one—where it not infrequently happens that the many factors controlling precipitation are so delicately balanced that a very small thing will turn the scale one way or the other. If this is actually the case it seems reasonable to believe that were an area of forest of sufficient size present, its influence could be counted on to weight the balance in favor of precipitation.

Further than this I am not willing now to go, for unfortunately there are no figures now available with which to support the assertion made. Incidentally I may say that it is my hope that in time some data may be got which will at least throw further light on this most interesting subject.

Nienie and Kamoku.

Now the practical bearing of the foregoing theorizing is this: Granted that the theory is correct, would sufficient benefit be derived from the increased precipitation, to justify devoting land that is in demand for other purposes, including (in due time) homesteads, to the purposes of a forest reserve, on which—the original forest having been destroyed—a new forest must be planted at considerable expense? This was the problem that confronted the Government in 1906 when the question of leasing the lands of Nienie and Kamoku came up for settlement. It was then decided, that *under the existing conditions* and in view of the demands of the future for other uses of the land, the Government would *not* be justified in attempting to create such a reserve; or to express it in another way, the benefits which might be derived from such a forest would not justify the necessary outlay and the loss of the land for other uses.

In favor of the forest reserve two further points came into

the question, (1) that a planted forest would probably have more or less commercial value, and (2) that in the matter of direct condensation considerable water could be caught and put to use. Particularly is this true with the Eucalyptus, as is evidenced at one of the Parker Ranch dairies where the drip from the leaves from several tall Blue Gums, condensed from the drifting trade wind clouds, supplies the water for a good sized tank.

On the other hand stood the demand for homesteads. Considering the relatively small area of land *suitable for agriculture* that yet remains in the control of the Government—another fact that is often wholly lost sight of in "small farmer" discussions—it is certain that with increasing facilities of transportation, such as the construction of the Hilo-Kohala Railroad, there will be great demand for the land between Waimea and the Hamakua homesteads. And it will be a just demand, for this area is certainly as suitable for homesteading, were the means of transportation available, as is any yet opened on the Island of Hawaii.

Whether or not the decision not to provide for a reserve was a wise one time alone can tell. It was the one that seemed wisest at the time and I see no reason now to change the opinion I held two years ago.

In this connection it may be said that the opportunity still remains, should it appear feasible to carry out such a plan, of reserving a belt of land across Nienie, Kamoku and Puukapu when these tracts come to be opened for homesteads, on which could be planted a shelter belt of woods that would serve both as a general wind break for the more exposed homesteads and also, were proper provision made, as a source of water through condensation. Compared with the area needed for a forest large enough to assist in influencing precipitation the area required for such a shelter belt would be small.

An Opportunity Lost.

At this point I would put on record that it is my belief that had such action been taken twenty or even ten years ago, the Government would *then* have been justified in reserving a block of forest across Hamakua, between say the 2100 foot contour line and a line drawn fairly straight from Puu Loa to the upper fence of the Kukuihaele Private Forest Reserve at Mud Lane. The limits named, of course, include what is now the upper tier of lots in several of the homestead tracts as well as most of the area burned over in 1901. The forest, though in part open, was then in such condition that had it been properly protected it would have again speedily closed in. Such a reserve would have enabled the Government to profit by whatever influence the forest of former times might have had on the stream flow and on the climate of Hamakua. To have made this reserve would,

in a word, have been the conservative thing to do, for a forest can always be opened up, whereas often it can not be replaced.

Had I been in a position to do so, I believe I should have recommended such a reservation, just as I now and hereby recommend to the private owners of forest land in Hamakua to go slow in the further opening up of the woods that remain. It is so very much easier to destroy than to replace a forest that where a forest yet exists it is only the part of conservative wisdom to weigh carefully all the arguments for and against, before clearing additional areas. Especially is this so where, as in the Kukuihaele Private Forest Reserve, the question comes in of an actually flowing stream. Unfortunately, on the Government lands in Hamakua it is now in most cases too late to take any steps that would be effective.

THE QUESTION AT ISSUE IN HAMAKUA.

Having set forth the facts of the case and the reasons that caused the Government to relinquish the idea of a forest reserve on the upper lands at the west end of Hamakua, it remains to discuss whether the Government should do anything toward a reserve in the rest of the district, or whether it shall be said: "The time when a forest reserve could have been made is past. It is now too late. Therefore, let the project be abandoned and the forest officials turn their attention to other districts."

The Belt of Existing Forest.

From the showing of facts I believe that whatever might, and perhaps ought to have been done in the past it is not now either feasible or wise for the Government to attempt a general forest reserve in Hamakua. My reasons for this belief are:

(1) That under existing conditions and taking into account the porosity of the soil in Hamakua, it is questionable if any forest reserve that could now be made would be of sufficient benefit for water shed protection and for the prevention of erosion to make it worth while; especially as the section that would benefit most by such protection is the very part that has passed into the control of numerous small owners.

(2) That the Government lands that could now be set apart are too scattered and too small in area, even when taken in combination with the private forest reserves to make it an object to set them apart.

(3) That the influence which such area of existing forest as could now be reserved might exert on the local climate would be inappreciable.

(4) That when it comes to the use of the remaining Government land in the existing forest belt in Hamakua as a commercial forest, from which wood might in time be sold, there are

other uses to which the land could more wisely be put. In other words, that as there is so much waste Government land, which nevertheless is capable of raising crops of trees, the Government would not be justified in devoting to this use its remaining lands in the forest belt in Hamakua, which are known to be suitable for agriculture.

I therefore recommend that the project to create a general forest reserve in Hamakua be abandoned.

The Land Above the Existing Forest, at the East End of the District.

It has been shown that with the leases made in December, 1906, the control of the larger mauka lands at the middle and west end of Hamakua passed from the Government for twenty-one years. This narrows the question down to the Government lands at the east end, namely Kaohe, Hoea-Kaao, Kealakaha-Niupea and Manowaialee. It is for the lease of these lands that the Kukaiau Plantation Company has applied, with a proposition to plant a certain number of trees between the elevations of 3000 and 4500 feet.

On the lands in question the same conditions obtain as to stream flow as exist at the middle and west end of Hamakua; further, the argument for the possible influences of a body of forest on precipitation is here of less weight, because the lands lie on the shoulder of Mauna Kea and consequently have the advantage of the natural barrier that that mountain mass presents to the trade wind clouds. Owing to the greater extent of the fires of 1901 at this end of the district even more of the original forest has disappeared than at the west end, so that except for a limited area near Puu Loa, artificial reforestation is essential to secure a new stand.

If, therefore, a forest were to be planted in this section of Hamakua its chief value would be on account of the commercial importance of the wood and timber that it could produce. The question at issue is then, the creation of a forest of commercial value versus the use of the land for other purposes.

Of these, homesteading and grazing are the only ones that appear feasible. Up to 3000 feet there seems good prospect that the land can be used to advantage for agriculture at the present time or at any rate as soon as conditions of transportation are somewhat improved. Above that elevation until there has taken place a marked improvement in the available means of controlling insects, blights and other kindred pests, and until transportation conditions are decidedly better, the average homesteader could hardly be expected to do more than eke out a precarious existence. Just how soon the conditions will be improved no man can say. With the building of the Hilo-Kohala Railroad the requirements of transportation will be met; while

it is only reasonable to expect that in due course scientific investigations—that at present neither the Territorial nor the Federal Government has the funds to undertake—will demonstrate how the pests can effectively be combatted.

As conditions now are, and as they must necessarily remain for some years, the only practicable use of the land is grazing. Consequently the question narrows still further to grazing versus a commercial forest, or more exactly, in view of the Kukaiau Plantation's application, to grazing with a tree planting clause versus the ultimate planting of a commercial forest by the Territory. On this point I cannot do better than to quote the opinion already expressed by me in my report of November 11, 1907, of the soundness of which my recent trip to Hamakua only the more firmly convinces me. The statement there made, with a few bracketed interpolations, is as follows:,

"I am not in favor of a reservation with the idea of ultimate replanting because I believe that to undertake forest planting on an extensive scale in such a district as Hamakua is contrary to the general forest policy that has been adopted by the Territory as best meeting the needs of the islands as a whole.

"Forest planting costs money. The three possible sources of revenue are: (1) direct legislative appropriations, (2) income from the sale of forest products from forest reserves, and (3) contributions from private interests. Even were the money available under either of the first two heads it is a grave question whether, in view of the other pressing forest needs in the Territory, to use it for [commercial] forest planting in a section like Hamakua would be wise. Personally, I think a wiser use would be to secure better protection, through fencing and systematic administration, of certain of the already established [protection forest] reserves. Or if planting were to be undertaken, to confine it to filling in blanks in existing forests or to work of similar character.

"If the Territory had a large revenue, which is distinctly not the case, considerable sums might well be expended in forest planting. As it is, I believe that what money is available can be more wisely used in other ways. In any event there is no money now in sight under either the first or the second head, nor is it very likely that any considerable amount could be got from private sources for replanting public lands in Hamakua, especially in view of the work waiting to be done in the planting of gulch sides and waste lands on the plantations.

"The foregoing statement does not, however, mean that the Government should refrain from doing what it can toward forest replacement, either in the direct planting of limited areas or in the encouragement of larger planting projects—quite to the contrary. And for this reason I am heartily in favor (as I have already reported to this Committee) of the general terms of a proposition made to the Government by the Kukaiau Plantation

Company to plant on a portion of the land of Kaohe a certain number of Eucalyptus trees per acre, as one of the terms of a lease of that land for grazing purposes. The idea is to provide groves for the protection of stock; the trees to be fenced in until large enough to care for themselves; the groves to be maintained to the end of the lease. This would not reforest the land—it is not intended to—but it would increase its value to the Government, as well as to the lessee, and would also provide groups of trees that, were it later thought desirable to bring the land again under forest, would serve as seed plots. From the experience with Eucalyptus at Olinda and at Ulupalakua on Maui, there is no question but that at the expiration of the proposed lease the trees to be planted could be depended on to do their part, [to say nothing of the merchantable timber that might be sold by the Government at the end of the lease.] With the outlook as it is, it seems to me the wise plan to permit these lands to be leased and made remunerative under such a plan, rather than to hold them unproductive for an indefinite time."

Additional Information.

Certain new points were brought out during my visit to Hamakua. As a result I recommend that in addition to the suggestions that have already been made, and accepted, as to the stipulations to be embodied in the lease, the following be added:

(1) That the planting be subject to the approval of the Forest Officials of the Territory.

(2) That so far as climatic conditions render it practicable, not less than one-eighth (1/8) of the trees to be planted be set out during each of the first eight years of the lease, until the full number has been reached.

(3) That on the land of Manowaialee all the planting be confined to one block adjoining and extending the area of existing forest, which block, with the existing native forest below shall be kept fenced off during the term of the lease. A further examination of this land, made during my recent visit to Hamakua, leads me to believe that except for this suggestion, Manowaialee should be treated in the same manner as the other lands; not separately as was formerly recommended.

As I understand it, it is already the intention of the Kukaiau Plantation Company to conform to the spirit of these suggestions, but it would do no harm to have it specified in the lease.

I further recommend to owners of private land in Hamakua that in view of the diminishing wood supply in the District all waste areas should be planted with commercially valuable trees. In time the groves so started will prove a valuable asset to their owners.

The suggestion was made by a number of persons that the lands should be put up in several small blocks rather than one

large one, in order that more persons should have an opportunity to acquire land. This question I do not consider as coming within my province so I shall not discuss it, beyond saying that from a forest standpoint it obviously would be simplier to control the tree planting work if it were done by one responsible company rather than by a number of individuals. Another suggestion, that the successful bidder be bonded to carry out the terms of the lease is one that does not concern this Department.

In connection with certain lots in the upper tier of the Ahualoa Homesteads, above Honokaa, on which there is some available water, the suggestion was made that these areas (Lots 9 and 10 and 5, mauka) be reserved and that the water on them be developed and piped down to Honokaa to furnish a domestic supply for that village. These lots are still in the control of the Territory, though just now they are being used by the Parker Ranch. Whether sufficient water could be developed to make the plan practicable is a question that requires an investigation by a water expert. There is also to be considered whether it would not be possible and better to make an arrangement with the Hamakua Ditch Company, whereby water from the ditch could be delivered to the people at Honokaa. Before title to these lots passes from the Government I believe this matter should be carefully looked into.

There is one more point that should be considered, the insertion in the lease of a clause permitting the withdrawal of portions of the land for forest purposes. The Kukaiau Plantation Company argues that unless the lessee is sure of holding the land for twenty-one years he cannot afford to pay the stipulated rental and also to do the tree planting required. In view of the benefits to be derived by the Government from the improvement of the land through tree planting, plus the annual cash rental to be paid in, the Commissioner of Public Lands agreed in this case to waive the usual homestead withdrawal clause. The same reasoning applies to the forest withdrawal clause as well and is, I believe, sufficiently well founded to justify the Board in signifying to the Commissioner of Public Lands its willingness that in this particular case that clause also be waived. Under the existing conditions in Hamakua I believe that more real benefit will be secured in this way than by a rigid adherence to the adopted rule. Indeed, even if it were desired ultimately to reforest the upper levels in Hamakua the plan proposed, resulting as it does in seed spots, would not be a bad way to go about it. The Government can afford better than the individual to wait a considerable time for results.

RECOMMENDATIONS.

Based on the foregoing statement of reasons I therefore recommend that the Board of Agriculture and Forestry reaffirm its

approval of the general terms of the application of the Kukaiau Plantation Company for the lands at the east end of Hamakua; that insistance on the forest withdrawal clause be in this instance waived; and that the Commissioner of Public Lands be informed of the action taken.

SUMMARY OF RECOMMENDATIONS.

The recommendations in this report, based on my findings in Hamakua and supported by reasons that have been set forth in detail, may thus be summarized:

(1) That under the conditions now existing in the District of Hamakua it is neither feasible nor wise to attempt the creation of a general forest reserve in that district.

(2) That in view of existing facts and future needs the Government was fully justified in leasing Nienie and Kamoku under the provisions that it did.

(3) That Kaohe and the other lands at the east end of the District should be leased under the general terms proposed in the application of the Kukaiau Plantation Company.

(4) That it is to the personal interest of the private owners of forest land in Hamakua to act in a conservative way as regards clearing additional areas of forest, in view of the fact that it is very much easier to destroy forest than to replace it.

(5) That in view of the growing scarcity of wood and the lessened area of native forest from which a local supply could be got, all waste areas of private land, not otherwise used, should be planted with commercially valuable trees.

Very respectfully,

RALPH S. HOSMER,

Superintendent of Forestry.

AN ACKNOWLEDGMENT.

By an inadvertence proper acknowledgment of an article which appeared in the last number of the Forester, was omitted. We refer to the paper entitled 'Rats' which was taken from the Journal of the Agricultural Society of Jamaica.

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

DIVISION OF ENTOMOLOGY.

REPORT ON HORTICULTURAL-QUARANTINE INSPECTION WORK.

Honolulu, Hawaii, Feb. 29, 1908.

To the Honorable Board of

Commissioners of Agriculture and Forestry,

Honolulu, T. H.

Gentlemen:—

In the absence on leave of my chief, Mr. Alexander Craw, who sailed for the coast per "Alameda" on February 19th, I have the honor to report herewith the work of this Division during the month just past.

The 26 vessels that reached this port during the month from outside the Territory brought a total of 7802 parcels, of which 89 came in the mails, 7701 as freight, and 12 as passengers' baggage. They were all inspected in the usual manner and disposed of as follows:

INSPECTION FOR FEBRUARY, 1908.

Disposal.	No. of Parcels.	Causes.
Burned	10	Too badly decayed for necessary inspection.
Fumigated	19	Infested with live insects, or coming from suspicious localities.
Ordered returned	150	Very scabby potatoes.
Passed	7623	Free from possible pests.
Total	7802	

It may interest the Board to know in this connection that we take the precaution of fumigating with Hydrocyanic acid gas all plants from California, especially those sent with leaves on, in order to prevent the introduction of the white fly that has recently been found established in that State, and which is a terrible pest of Citrus and other plants in Florida. Also, all plants arriving from the Orient because of our comparative ignorance of the economic insect fauna of that quarter of the globe, are invariably subjected to the cyanide fumes.

Our attention has been attracted by the large quantity of worm eaten, scabby potatoes reaching this port. On previous occasions we were compelled to order potatoes returned because of the abundance of scab and evidence of insect work upon them. Recently we submitted a sample of scabby potato to a plant pathologist who identified the scab definitely with that dread disease of potatoes in the United States, scab, and expressed himself unable to state whether the scab here would confine itself to potatoes. This tuber has since been receiving very careful scrutiny from us. The matter has also been referred to your Committee on Entomology for advice and instruction.

Herewith I append, by way of exhibit, our "Entomological Inspection Sheet" for the past month to convey to you an idea of the method employed in keeping tabulated record of this part of the work.

ROUTINE AND OTHER WORK.

In addition to the work of inspection the Division force was kept busy with the office routine and care of Mr. Koebele's recent shipment of beneficial insects. One of them, *Azya,* a ladybird and voracious eater of scale-bugs known as Lecaniids promises to locate here. From eggs laid in jars upon Lecaniid infested twigs a large number of the ladybirds are approaching maturity.

Respectfully yours,

JACOB KOTINSKY,

Assistant Entomologist.

BRUSH FIRES ON TANTALUS.

Notice is hereby given that in accordance with Section 6 of Act 71 of the Session Laws of 1905 it is forbidden to start fires for the burning of brush, dry grass, etc., for a period of twelve (12) months from date, within that portion of the District of Kona, Island of Oahu, lying between Manoa and Pauoa Valleys, above the makai edge of the Eucalyptus forest, the Makiki reservoir and the foot of Round Top, unless the written permission of the District Fire Warden has been first obtained. The law reads "such fires shall not be started during a heavy wind or without sufficient help present to control the same, and the fire shall be watched by the person setting the same, or by competent agents of his, until put out."

The District Fire Warden is Mr. Walter M. Giffard.

RALPH S. HOSMER,

Chief Fire Warden.

Honolulu, Hawaii, Feb. 13, 1908.

THE DESTRUCTION OF MOSQUITOES.

(To the Editor of The Times.)

Sir:—Any suggestions or discoveries that help towards the destruction of mosquitoes and other insect pests in their larva stage are of such great importance that I venture to ask you to give me a small space in which to record some results which have been attained in the West Indies.

It has long been known that Barbados is the only West Indian island that is absolutely free from malaria and from the presence of the *anopheles* mosquito. Major Hodder, R.E., in his reports to the War Office three years ago on the drainage works that were then being carried out in St. Lucia, came to the conclusion that there was some hitherto undiscovered reason why the *anopheles* failed to propagate its kind in Barbados where the *culex* was abundant. It appeared from his observations that the *anopheles* could, or did, only breed on the ground level; none of its larvae being found in tanks which were raised a few feet from the earth, nor even in those which were actually resting on the ground. The *culex* can, on the other hand, breed in the gutters on the roofs of high buildings as easily as in the low-lying swamps and pools. My friend, Mr. C. Kenrick Gibbons, who had given a good deal of attention to the matter, pointed out at once that all the pools and swamps in this island were stocked with swarms of a tiny fish (known locally, from their vast numbers, as ''millions''), and that their favorite food was the larvae of the mosquito. It is obvious that any species of that insect which is unable to breed above the ground level must fall a prey to this enemy. The fish has been identified by Mr. Boulenger, F.R.S., of the British Museum, as *Girardinus poeciloides*. Some specimens were successfully got to England, and flourished for some time in the insect house at the Zoölogical Society's Gardens. Mr. Gibbons' suggestion that the ''millions'' should be imported into malarial districts in other islands has been acted upon, and with felicitous results. For instance, the Country Health Board of Antigua, ''being convinced of the useful part played by these fish in consuming mosquito larvae, have arranged for their systematic distribution throughout the ponds and streams of the island.'' Similar news comes from Jamaica, whither a consignment of the fish was sent in November, 1906. The secretary of the Agricultural Society writes that the tanks at the Titchfield Hotel are full of them, and that he had been informed that ''there has been a marked diminution of fever round about, the 'millions' evidently accounting for the mosquito larvae.'' They have also been sent to Colon and to British Guiana. One cannot help wishing that these useful little fish were given a trial in the deadly districts of Africa, if, like the malarial mosquito, the insects which convey the terrible diseases which are endemic there, pass the larva stage of their existence in water. One may add in this connexion that the Swedish Consul at Frankfort has discovered a small fish (''the blue-eyed'') which feeds on mosquito larvae, and that, at the request of the Italian Government, some are to be, or have been, sent to the Campagna, where so much has been done in recent years to diminish malaria.

I am, Sir, your obedient servant,

T. HERBERT BINDLEY.

Codrington College, Barbados, March.

''Times,'' London, April, 1908.

THE HAWAIIAN

FORESTER AND AGRICULTURIST

Vol. V MAY, 1908 No. 5

The five indispensably essential materials in our civilization are Wood, Water, Coal, Iron and Agricultural products.—Gifford Pinchot.

The National Resources Convention which takes place in Washington while we are at press, is one of the most significant and important events in the history of the American nation. That such a statement should be made of a deliberation of which very little attention has been given by the general public may at first create surprise, but when the expected results of the convention now in session have been allowed time to develop, it will become apparent that their influence has materially aided in insuring to the nation a continuation of that wonderful prosperity which she now enjoys.

In analysing the causes which have contributed to the unrivalled wealth and prosperity of the United States, one of the most important is the magnificent store of natural resources with which she has been endowed. To this priceless heritage is greatly due her envied position in agriculture, in mining, in commerce, in manufacture and her success in every one of the manifold occupations dependent upon these great industries. Too often, however, the enormous natural deposits of wealth, are looked upon as being 'exhaustible,' and are exploited as if they were indeed incapable of diminution. A careful examination has, however, revealed the fact that in almost every instance in which the very existence of the supremacy of the nation depends upon the continuance of the supply of a natural product, the disappearance of the latter is proceeding at such a rate that within the life of many now living its output will practically cease. To bring about this unfortunate condition, ignorance, stupidity, wantonness and reckless disregard of the rights of posterity have alike contributed, until today, unless some radical measures are taken to safeguard and transmit to future generations what yet remains of our resources, the most certain national disaster must follow.

With regard to the supply of coal, upon which the success of many industrial pursuits depends, the present practice of mining is conducted in such a manner that only the best portions of the deposits are removed, after which the shafts are allowed to fall

in and leave the less desirable qualities permanently inaccessible, and therefore, destroyed, so far as a national asset is concerned. Many coal fields have already become worked out and by the most reliable computation of the supply yet remaining, anthracite coal is believed to be sufficient to last for about fifty years and bituminous coal for probably as much longer. Of the coal actually extracted from the earth but five per cent. of the potential power is made use of. With a more intelligent or less wasteful system of mining and an improved process of obtaining a larger proportion of the energy stored up in this fuel, the existing deposits should last much longer than the period now assigned to them.

In the case of the other natural fuels, oil and gas, much that has been said with regard to coal applies, for in these industries also the most prodigal waste occurs, and enormous supplies are purposely destroyed.

The mining of iron ore is carried on in the same wasteful method as employed for obtaining coal, and large quantities of this valuable ore, upon the continuance of whose supply so many industries depend, are left forever inaccessible. The waste of the by-products from furnaces, which in other countries are turned to profitable use, is also responsible for enormous loss, which should be saved to the nation.

Turning from the unnecessary depletion which the country is suffering in respect to the hidden treasures of the earth, we find the condition of affairs not less disquieting with regard to the national lands themselves. Vast acreages of public domain have been wrongfully appropriated by exploiters and have not gone to benefit the home builder. In order to insure the best use of the national lands from a national standpoint it is indispensable that they be divided into small homestead areas cultivated by small owners. It is none the less imperative that such homesteads pass directly from the government to the people, and that the intervention of no speculator or exploiter be allowed to intervene to wrest from the tiller of the soil an increment which has not been earned. The wrongful appropriation of public lands in the past has already greatly impoverished this source of national wealth and some efficient means is looked for, not only to check such action, but whenever possible to divest speculators of wrongfully obtained tracts.

At the present rate of consumption a period of thirty-three years will see the total disappearance of our useful timber—unless a general better order of lumbering be inaugurated. If the forests be allowed to fail, our fourth important industry will pass away, the mining of coal, of iron and every ore will become more expensive, the railways will be without ties, the watersheds will cease to yield their seasonal supply, every agricultural industry dependent upon irrigation will be crippled, torrential floods will denude and devastate the country, all articles into which wood, metal or wood-pulp paper enters, all food stuffs, all cotton and

woollen goods will materially advance in price, and the daily life and comfort of every inhabitant of the United States will become hampered and restrained.

One of the most serious consequences of deforestation will be the extensive denudation of fertile lands of their soil. The area annually stripped in the United States of its soil and rendered unproductive by erosion in consequence of destruction of forests, is estimated at hundreds of square miles. In the main, this enormous loss to the national resources is not only unnecessary but preventible by the adoption of sound methods of forestry.

The problems involved in the conservation of the inland waterways, together with those affecting the husbanding of the mineral deposits, national lands and lumber supplies, form a subject which is probably the most momentous now before the people of the United States. That efficient remedies can be found to lessen the wanton and thoughtless destruction of the national wealth is certain, and the conference at Washington, called by President Roosevelt, to deliberate upon the matter, will without doubt inaugurate a better order of things in some, at least, of the most important of these sources of waste. With regard to the mineral deposits, the adoption of a more enlightened procedure of mining, looking towards the abandonment of wasteful methods and a recognition of the rights of posterity, would greatly prolong their supply, so that by the time they approached exhaustion it could reasonably be hoped that science would have discovered substitutes to take their place. The conservation of the national forests is fraught with much more promise. A general enforcement of modern principles would insure the use of these assets in perpetuity, for it is well recognized that land can be made to grow trees as profitably as any other agricultural crop.

The representatives of Hawaii at the National Resources Conference accompanying Governor Frear, are Messrs. W. O. Smith, Alonzo Gartley and Ralph S. Hosmer. The personnel of the delegation is particularly satisfactory and insures to this Territory an efficient representation by men whose knowledge of such of our local conditions as may bear upon the greater national question is full and exact.

THE PRICE OF MEAT.

The great cattle and sheep ranges of the West, because of overgrazing, are capable, in an average year, of carrying but half the stock they once could support and should still. Their condition affects the price of meat in practically every city of the United States.—*Gifford Pinchot.*

THE MARKETING OF HAWAIIAN FRUITS.

Address delivered by Mr. J. E. Higgins, Horticulturist of the Hawaii Agricultural Experiment Station, before the Students of the College of Agriculture and Mechanic Arts, Friday evening, March 27, 1908.

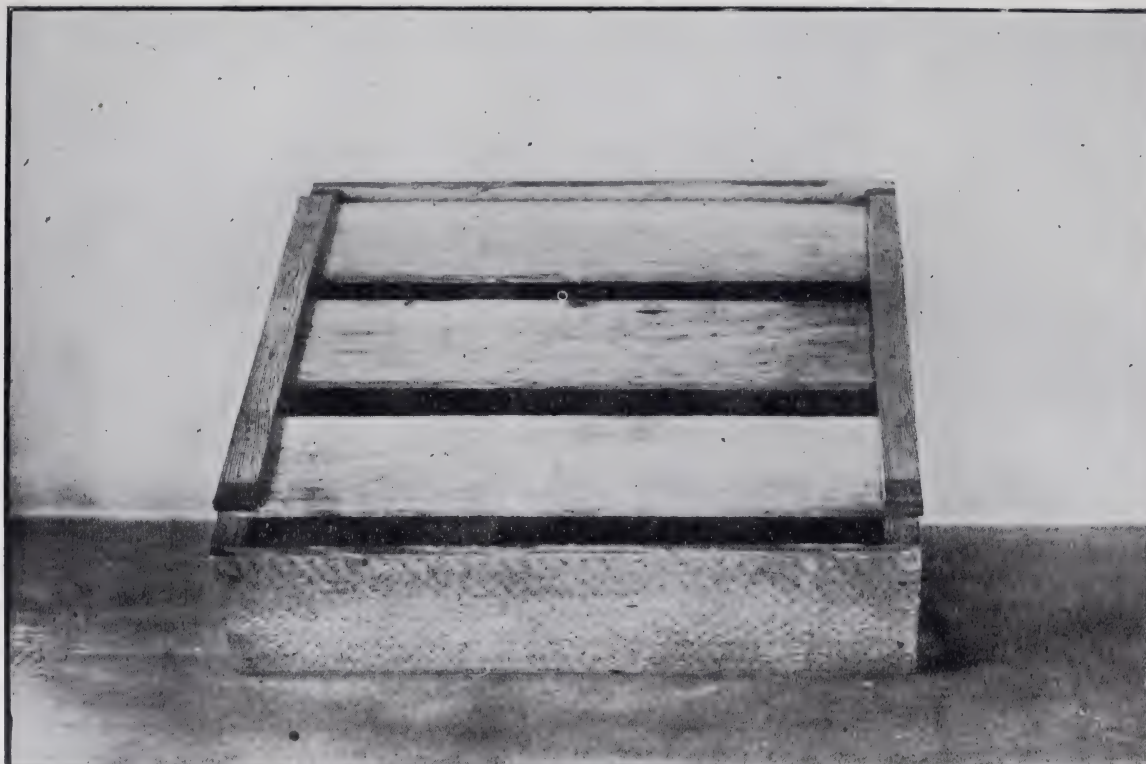
Ladies and Gentlemen:—

Our talk this evening will be on the subject of "The Marketing of Hawaiian Fruits." The subject is so large that I cannot hope to do more than rush through it and touch rapidly upon the different fruits and the methods of handling them.

THE AVOCADO.

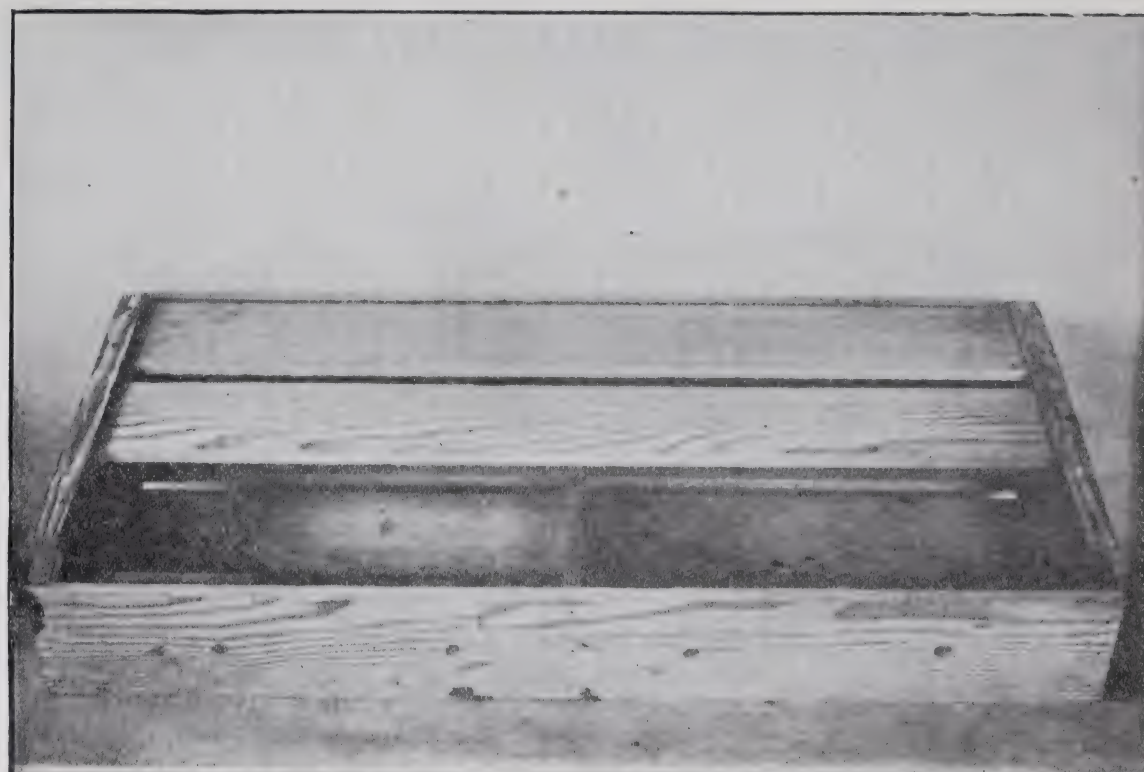
First, we will consider the avocado, which has always been considered a difficult fruit to ship. I do not consider it such. I consider that the avocado is a comparatively easy fruit to ship if it is handled in the proper way.

The picking of the fruit should be done within as short a time as possible previous to the sailing of the steamer. The avocado begins to soften very rapidly after it is picked, and as soon as that softening process begins, your troubles begin. You cannot then arrest successfully the maturing process and preserve the fruit. You should get it into cold storage as rapidly as possible after picking, and I would say that under our present facilities it is not quite safe to pick the fruit and place it in cold storage and then take it out to put it in the steamer, because the refrigerating compartment of the steamer, where you put your fruit in, has to be kept open for the reception of other fruit, and your fruit which has become chilled then becomes warmed again and then chilled, and these rapid changes in temperature are greatly conducive to the deterioration of the fruit. The fruit should be cut with great care so as to avoid bruising. Perhaps it seems superfluous to say this, yet I have seen people who are in the fruit business, handling avocados in a way in which a good down-east farmer would not treat his potatoes; I have seen them packed in boxes and specimens dropped from this height (indicating about 3½ or 4 feet) onto a concrete pavement floor and then picked up and put in the boxes as first-class merchantable avocados. That won't do. They must be handled with extreme care to avoid all bruising. The stems should be cut, as I have told you should be done in the case of oranges and lemons. Cut the stem comparatively near to the fruit and don't put in leaves—do not cut the stems long so as to include the leaves; about a quarter of an inch or an eighth of an inch is sufficient, that is, beyond the natural joint. The packing should be done also with care. I have brought here a few



AVOCADO CRATE, HOLDING ABOUT ONE DOZEN FRUITS.

crates to illustrate the different possible packages. This crate (indicating) holds approximately twenty-four avocados. There is a smaller crate which we have used which holds a dozen. It is exactly the same as half of this. This crate is more useful in sending smaller shipments that are going for private orders. In this crate you will see that the fruits are only one tier deep. All fruit should be wrapped with rather thin and yet strong paper. They should be placed so as to pack snugly. If you will recall the shape of the average avocado you will notice that it can be adjusted to a box of this size, even though it be a little smaller in diameter or a little larger. The adjustment can be done by means of tilting. If the avocado is long, you can place it like that (indicating); if it is wide, it can be tilted a little lower and the next one can be put this way (indicating); if this is point up, the next one can be put point down, and you can tilt it just as much as is necessary, the only requisite of the box being that it must be high enough to receive the avocado if it is lying directly on its side. These boxes we found were not quite large enough to receive the largest avocados. I would say, do not put any paper between the fruits. I found in San Francisco that many of our shippers from here were sending the fruits up there in orange crates and larger boxes than that and packing paper, wads of paper, in between the fruits. Doubtless the idea was to keep the fruit from bruising,—but what is the result? You have a solid mass of fruit and paper packed closely together; the circulation of air is rendered impossible, and it is about like trying to refrigerate a wad of cotton—you can't get the refrigeration into it; rather you can't get the heat out of it, you do not get the circulation of the air, the cold air, about the fruit. And there is no need of this paper if the fruit is carefully placed so as to be snug. Do not put in any leaves. The shipping must be in refrigeration only. When we first commenced shipping, people told us that we could not ship in refrigeration without the fruit all turning black. That depends upon the refrigeration. But ventilation is out of the question, ventilation without refrigeration is out of the question—the fruit will all arrive in the market in a condition too soft to be received by the wholesale trade. A great deal of it may arrive there in suitable condition for eating, but the trade will not take it in that form. The avocado will endure refrigeration for a term of three weeks anyway. The exact time we have not determined, but we have determined that it will not endure refrigeration as long as most temperate zone fruits. The first deteriorating effect of refrigeration is observable in the darkening of the flesh close to the seed, and then the flesh begins to turn rancid; but it is perfectly safe to send them as far as San Francisco or as far as New York, so far as the time element is concerned. The temperatures that are best adapted for the refrigeration of avocados has not been determined. We have carried them as low as between 40 and 45 and as high as 50. Fifty degrees I am satisfied is too high. Our



AVOCADO CRATE, HOLDING ABOUT 24 FRUITS.

next hope is to try them between 45 and 50, and I think that somewhere in there we will find the optimum temperature. The temperature must be constant, for variations in temperature, as I have said, are deleterious to all fruits.

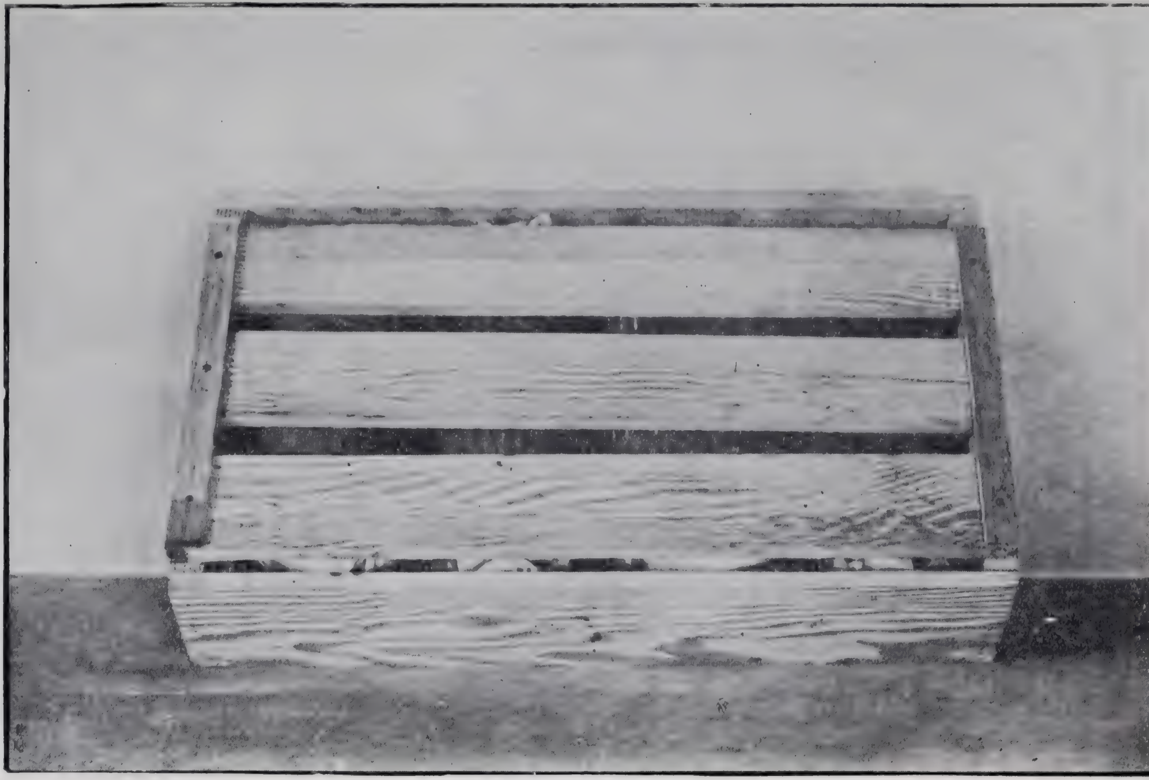
HANDLING THE FRUIT IN THE MARKET.

It is necessary when the fruit arrives in the market, if there is not a sale for it immediately, that it should be stored in refrigeration. If it is exposed, even in San Francisco where it is cool, the ripening processes begin and, as I have said before, once they get well under way it is difficult to arrest them and preserve the fruit. It is necessary, therefore, for the fruit to go into cold storage if there is not immediate sale for it. As to the market demands for avocados in San Francisco: As to color, they prefer a green avocado. I don't know why and I don't think they do, but they have been getting green avocados from Tahiti and possibly that may be the reason, but that is their preference at present. In other parts of the United States, well, from Pittsburg west, they have no preference, because they scarcely know the avocado—it is an unknown article—but in San Francisco it is a known fruit and that is what they are calling for—green fruit—although they will take the red, or the brown. I think that that is a matter, however, in which a change could easily be brought about, provided our best avocados should turn out to be the brown or the red. Some of our best varieties may be these. The market demands that the fruit be firm, as I have already told you. You cannot put fruit beginning to soften on the market. In the first place, it is a high-priced fruit and the buyers who handle the fruit will not take the risk of buying fruit at a high price which if it is not sold within a day or two is going to be a dead loss; but if the fruit is firm, it will sell and sell at a good price.

We should be careful in sending avocados to send only those of good quality. That is important. We are making our reputation and we want to make a good one. The prices which this fruit receives in San Francisco range from a dollar and a half to two dollars and a half per dozen. Fruits that are of good quality and firm will sell for $2.50 a dozen. As to the selling agent, I think I will postpone a discussion of that question until we come to a later part of the evening when we are talking of the marketing of other fruits, since the problem is the same.

THE MANGO.

The marketing of the mango is about the same as that of the avocado, with the following exceptions: The crates, while they must be small, need not be so small as in the case of the Avocado. Two or three layers will be endured a great deal better in the case of the mango than in the case of the avocado, but you must be



PAPAIA PACKAGE.

careful not to pack them in large packages. The refrigeration can be more prolonged in the case of the mango than in the case of the avocados. The mango can be kept for at least six weeks safely. The market demands for mangoes are nil. There are no demands. In San Francisco where the fruit comes in spasmodically from Tahiti and from Mexico, the sale is a fairly ready one, rather slow, but the supply is not constant, and the supply being inconstant, there is no constant demand, for that is a principle in all fruit marketing; a constant demand presupposes a constant supply. The mango weevil is perhaps our greatest enemy at the present time, our greatest obstacle in the way of a mango shipping industry. We have the mangoes, we have the varieties and we know we can grow them. We know also that such fruit can be sold, though there is no market now or a very limited one, but a market for such fruit as the mango can be created. But the mango weevil is present here, as you know. The larva hatches in the egg in the seed and because it is in the seed you cannot examine the exterior of the fruit and know whether you have the mango weevil or not, and hence the inspectors on the mainland feel that it is a very important thing that they should see that the mango weevil does not get into California and thence into the whole United States. It is not yet determined whether the mango weevil will affect other fruits than mango or not. I believe the entomologists tell us that it has not been reported upon any other fruit or plant than the mango. Yet careful men wish to avoid all chances, and we will have to expect that our fruits will be carefully examined when they reach San Francisco, and if they are infested with the weevil, they will be turned down.

THE PAPAIA.

The picking of the papaia for the San Francisco or for any shipping market, should be done when the faintest thinges of yellow appear. As in the case of the avocado, it should be picked as nearly as possible to the time of the sailing of the ship. In picking the papaia the stem should be cut about an inch or an inch and a half long. Here there is opportunity for some latitude as the length of the stem may be varied slightly to facilitate the packing of the fruit. This crate (indicating) is adapted to the packing of the smaller papaias of the long type. If the papaia does not just fit here in its length, you can make some slight differences in the cutting, cut the stem half an inch longer or half an inch shorter and this crate accommodates them. The papaia should be handled with care also. The wrapping should be done with rather heavy paper and it is preferable to have it glazed, because if any fruit begins to decay or to get soft, an unglazed paper will allow the moisture to pass through to the adjoining fruit more quickly than the glazed paper will. The shipping must of necessity be in refrigeration. Ventilation alone is again out

of the question in the case of the papaia, and extreme care is necessary on the part of the steamship agents and everybody who handles the fruit to see that it is not bruised. Picking up a crate of fruit and letting it drop an inch or an inch and a half jars the fruit and bruises it. The papaia is unknown in the markets, but it is a taste which is rapidly acquired, as you know, by almost everybody. Everybody who comes to the islands either enjoys the fruit at first contact or very rapidly acquires the taste; and I believe that a good market for papaias could be worked up, particularly during the season when the cantaloupes cannot be found in the market.

THE BANANA.

The banana should be cut before it becomes too "full," as the term is used. You will recall that a banana when it is immature has ridges—corners—on it. When it becomes fully mature and the fruit begins to turn yellow, those ridges on the Chinese variety and also on the Bluefields or Jamaica variety, disappear. When the fruit has become fully rounded it is too far advanced for shipping. Nobody can describe the stage of maturity at which it is best to cut the fruit—that has to be determined by experience. The fruit must be cut while it still retains the ridges, but the degree of maturity will depend upon the distance to market. The wrapper: Grass has been used as a wrapper. Banana leaves are more commonly used and are very much preferable. The banana leaves may be kept dryer than the grass. Grass has a tendency to absorb moisture and to hold moisture and dampness, and that causes the fruit to sweat and causes the "Ripe Rot" to develop, the fruit to turn black and to soften. Mistakes were made, particularly in the Hilo banana trade in shipping the fruits in moist grass. On the mainland last summer I found a banana drum being used for the shipping of bananas from the great central markets into the tributary territory. These drums were constructed of heavy cardboard, and were just large enough to contain a single bunch. They are made of two sizes, large enough to contain a single bunch. Around the top of the drum the top hoop held a strong piece of paper in place, which was drawn up from the top of the drum and tied to the stem of the banana, and that was the way in which the fruit was carried—by its stem. Whether that would be practicable for our shipping I do not know. I have sent for some of these and we hope to have them on hand and give them a closer examination and possibly we may be able to give them a trial. They are also making a similar drum out of veneer instead of the paper. Refrigeration is absolutely not adapted for the banana. Bananas shipped in refrigeration turn black and never ripen. The "banana trust," as it is called—the United Fruit Company—ship their bananas across the hot plains in the summertime with ice—in the ice bunkers of the refriger-

ating cars—but they are always watched; frequently the doors are open, the ventilators are opened. These trains are always accompanied by an attendant, who sees to it that the temperature never gets down below. The ice is simply to overcome the intense heat and hold back the ripening a little.

The Bluefields versus the Chinese variety for shipping: The Chinese banana, as you know, is very subject to what is known as the "Ripe Rot" disease. That is the fungus disease that causes the banana to become spotted, specked with little black specks. When the disease spreads and the black specks become united, it forms large blotches, which, in the last stages of the disease—I mean the fruiting stages of the fungus—produce a reddish, roseate-tinged spot where the black spot was previously. That you may not have noticed, but if you will get some bananas and allow them to ripen and rot, if they have these black spots I think you will notice finally this red fruiting stage of the fungus. The Bluefields banana is quite resistant to the disease and, as a consequence, it arrives in the market in a bright yellow form. Sometimes you see black spots on them where they have rubbed together or where they have rubbd against the next bunch, because they are shipped naked, without any wrapping, but this is due to bruising. The Bluefields or Jamaica variety holds to the bunch better than the Chinese. There has been a complaint against some of those that we have grown here. Though that complaint may be due in part to our soil and climate, I believe that it has been due to hanging the bunches the wrong way. The Chinese banana is hung in one direction and the Bluefields in another, as I will show you in the slides later. A Bluefields banana hangs close up to the stem of the bunch, and as it grows from the tree, the individual fruits come out like that (indicating) and go up. Now if you hang the bunch up that way in the market, when the fruits begin to ripen, the weight simply breaks them off; if you reverse the thing—hang them up by the smaller end—they hang more naturally and their weight is a pull rather than a thrust and they will stand it.

The capacity of the Pacific coast for bananas, as near as I am able to estimate it from the information which I have gathered in many cities on the Western slope, is about 826,000 bunches per annum, and of these Hawaii ships about 15,000 bunches a month. You will see that our competitors ship a great many more bananas all the way from New Orleans or Mobile than we ship from here, and pay high freight rates on them, too. There is a freight rate of about $1.25 a hundred, if I recall it, from New Orleans to any point on the Pacific coast. The cooking bananas have not got into the market at all. I believe there is an opening for cooking bananas in the markets. Some of our "maia maoli," the variety that is most commonly used for cooking, the common cooking banana of our markets, I believe would find a ready sale in the mainland markets if the people ever became acquainted with them.

There certainly is no fruit more delicious when properly cooked than a "maia maoli."

THE PINEAPPLE.

There are a great many points to be considered in the proper shipping of pineapples. Here, again, I want to emphasize the matter of the care in handling. The packing of a ton or a ton and a half of pineapples on a wagon loose, rubbing against each other, over rough roads and perhaps without springs on the wagon, certainly is not to the advantage of the fruit. In all experiments we have found that pineapples cut with long stems carry to the market in very much better condition than those that are cut with short stems. Now, as to packing: At the present time the large portion of our pineapples that go to the market as fresh fruit are packed in a crate that is in my opinion entirely too large for the fruit. We have the most delicate, the most delicious and the largest fruit, the best pineaples that are commonly found in the markets. We put them into the largest crate—the largest package—of any pineapples that go into the market. We are at the extremes in both ways: the best fruit, the poorest package. Several attempts have been made to use other crates and some of them are an improvement. There is a crate, devised by Mr. Byron O. Clark, who is present with us tonight, which is an improvement in that it contains much less fruit and has rounded corners so that it does not receive as many opportunities to have the staves split off. It comes as near the advantages of the round or barrel-form of any crate that we have tried. As to packing material, there appears to be very little difference whether we use excelsior or dried wild grass, provided the latter is perfctly dry. The danger with grass is in using it when it is not perfectly dry. The paper wrapping should be heavy and, as in the case of the papaia, it is better that it should be glazed. Each wrapper should be large enough to cover the whole fruit, including the base, but not necessarily the crown; it can be pressed about the crown and made to cover the stem. It is important that there should be a solid pack.

There is nothing here (on the blackboard) in regard to shipping, but I believe that that is our most important problem at the present time, that is, to get suitable shipping facilities. What we need is steamers that will carry the fruit with good ventilation, keep the fruit cool and keep the circulation of air about it. Another need of equal importance is an organization which can place in the important mainland markets representatives to handle our fruits, an organization to act as the representative of the Hawaiian growers. What I am saying now in regard to pineapples applies to every fruit that I have discussed, but it is most practicable at the present time in the case of pineapples, because that industry has grown to assume such large proportions. I cannot

stop to tell you all the reasons for this. I have brought here a number of bulletins at Mr. Pope's suggestion, bulletins covering the subject of citrus fruits, which I have discussed with you, and also the mango, and this bulletin on the marketing of Hawaiian fruits. In the latter part of this you will find something of my ideas in regard to the marketing systems and the absurdity that appears to me to be involved in the so-called "Commission System"—"consigning system," and a better system which I think ought to be inaugurated. I think we will take the few minutes that remain to run through a few of the slides which will illustrate some of the things which I have said.

A number of slides of the different fruits were then exhibited, with explanations by Mr. Higgins.

In answer to a question, as to the advantage of sealing the ends of various fruits with sealing wax or other substances to prevent diseases, etc., the speaker said that it had not as yet been determined definitely whether such sealing was an advantage or not; that experiments would have to be conducted with the different fruits and sealing materials to decide that point. The advantage would be in preventing infection, but in many cases the spores would have gained entrance before the sealing process had begun.

OUR THIRD NATIONAL CRISIS.

In the first great crisis of our history, the Revolution, another people attempted from without to halt the march of our destiny by refusing to us liberty. With reasonable prudence and preparedness we need never fear another such attempt. If there be danger, it is not from an external source. In the second great crisis, the Civil War, a part of our own people strove for an end which would have checked the progress of our development. Another such attempt has become forever impossible. If there be danger, it is not from a division of our people.

In the third great crisis of our history, which has now come upon us unawares, our whole people, unconsciously and for lack of foresight, seem to have united together to deprive the nation of the great natural resources without which it cannot endure. This is the pressing danger now, and it is not the least to which our national life has been exposed. A nation deprived of liberty may win it, a nation divided may reunite, but a nation whose natural resources are destroyed, must inevitably pay the penalty of poverty, degradation and decay.—*Gifford Pinchot, United States Forester, in the World's Work.*

TREES AS CROPS.

The Secretary of Agriculture in the part of his annual report wherein he speaks of the National Forests, says: "It is as sure that forest land can be made to grow successive crops of trees under proper methods as that plow land can be made to grow successive crops of wheat."

This country which once could boast of forest resources richer than any other nation in the world, has been cutting three times as much timber for a number of years as there is grown, and the consideration of timber as a crop to be carefully harvested has come at a time when many of the virgin forests are already depleted. Secretary Wilson, in continuing his subject, says in part:

"Just as American farming has had to develop and is still developing methods adapted to the conditions of each region to make the best use of the agricultural lands, so must the forester learn by scientific study and practical trial to make the best use of our timberland. And the best use means, of course, not merely its best use for the growing of trees, but its best use with reference to all interests directly or indirectly affected by it.

"As time passes, it will doubtless appear that the principles which centuries of experience in older countries have placed at our command can be applied with increasing good results as we grow more familiar with our own special conditions. The issue is sharply between caring for our forests by applying a system of known efficiency, or suffering certain loss not only of the forests, but of usuable water and soil as well, through the operation of causes as certain to act as are the rivers to run to the sea."

The Forest Service now has administration over more than 164,000,000 acres of land. This is slightly more than one-fifth of the country's total forested area; the remainder is in the hands of private owners. Nearly all the timberland of the unappropriated public domain is now in the National Forests. This means that is being protected against fire, theft, and wasteful exploitation, that its power to grow wood and store water is being safeguarded for all time, and that nevertheless, its present supply of useful material is open to immediate use whenever it is wanted. The report says:

"The timber in the National Forests, which is the legacy of the growth of centuries, is now in the truest sense public property, administered for the benefit of the people, primarily for the benefit of the people of the West, since they are nearest at hand, but on the whole, for the benefit of every part of the country, since the welfare of every section is interwoven with that of all others. The communities and settlers adjacent to the forests are safe from any fear of monopoly of one of the chief necessities of civilized man."

The Secretary relates interestingly how the government manages its timberlands as a trustee. It gives timber away through free-use permits in small quantities to the actual homemaker who comes to develop the country, and in larger quantities to communities for public purposes. Its system of management is vastly different from that of a landlord. When large quantities of timber are harvested from the National Forests, sales are made to the highest bidder, but under such restrictions as look to the maintenance of a lasting supply answering to the needs of the locality, to be had without favoritism and without extortionate demand based upon the necessity of the consumer.

ADVANCE IN WOOD PRESERVATION.

A government expert who is an authority on wood preservation, says as follows: "Timber thoroughly treated with proper preservatives will last almost indefinitely. Engineers have known for years that this is true, but up to the present time, at least in America, complicated and expensive plants have been necessary for the work, and wood preservation has often been too expensive an operation to allow treated timber to come into general use."

Methods in wood preservation have undergone a marked change in the last few years, however, and the work which a few years ago was limited to a few experiments carried on in scattered parts of the United States has grown with such rapidity that wood preservation has become a business which figures most prominently in the industrial life of this country.

Each year railroads are treating an increasing portion of their cross ties, miners their mine props, farmers their fence posts and the men of many other industries are bringing preservatives into play to close the pores and prepare the timber they use to resist the fungi which cause decay. The work points the way to one of the chief means of the conservation of the nation's forest resources, for as the length of the life of timber is increased the drain upon the forests is lessened, and more wood made available for use.

In nearly all localities in the Rocky Mountains and Pacific States is found an abundant supply of certain kinds of timber which have only a slight commercial importance. Engelmann spruce, lodgepole and other kinds of pine, aspen, and cottonwood are only a partial list of the kinds of wood which are strong enough and abundant enough to win high value for construction purposes, were it not for one single defect which has prevented their general adoption. When exposed to the soil and weather they decay so rapidly that they have to be renewed too often to justify their use.

Dead timber of lodgepole pine and other species also is found in large tracts, but is sharply discriminated against by all constructing engineers and contractors. As a matter of fact, the dead tim-

ber, provided it is sound, is just as good as green timber of the same species; and indeed, in some ways, is even more valuable. For it is well known that thoroughly seasoned timber is both stronger and more durable than the same timber when green. Timber which was killed by fire or insects, and which is still in a sound condition, differs from green timber chiefly in being thoroughly seasoned—that is to say, it is stronger, more durable and lighter. And so not only are the freight rates considerably reduced, but a better grade of timber is secured.

Even in a thoroughly seasoned condition, lodgepole pine, Engelmann spruce, and the other species mentioned above, are by no means durable woods when compared with Douglas fir, Oregon cedar, and the other kinds of wood which are used so extensively in construction work. And before they can successfully compete with such timbers, in spite of their lower price, they must be made to last longer under unfavorable conditions.

After several years study, the United States Forest Service has proved that in many cases the complicated and expensive plants are not necessary for the proper treatment of many kinds of timber; and that many of the timbers which decay most rapidly in the natural state, are among the easiest and cheapest to treat. Many of the species mentioned above offer little resistance to the entrance of the preservative. The principle of the method is to immerse the thoroughly seasoned wood in a hot bath of the liquid, leave it in for a few hours, and then either plunge it into a cold bath of a preservative, or else run out the hot liquid from the treating tank, and fill it up again with liquid of a lower temperature. This requires only the simplest kind of machinery, and the cost of operation is so slight that even cheap timbers like fence posts and shingles can be treated by the average farmer of small means.

Although the Forest Service, by extensive experiments in all portions of the country, considers that the practicability of the process has been conclusively proved, more or less difficulty has been encountered in inducing others to adopt the process on a commercial scale. In order to demonstrate beyond any doubt that the process is adapted to commercial treatments, the Service has arranged to erect small treating plants—semi-commercial in size—on several of the National Forests. Tests will be made on the local timbers, and careful record kept of the cost of the work. The treated timber will then be placed in permanent position, where its future durability can be compared with untreated timber of the same or other kinds.

Three such plants will be erected this spring, and it is expected that they will be in successful operation by early summer. According to the present plans one plant will be erected at some locality on or near the Black Hills National Forest, South Dakota; another on the Holy Cross National Forest in Colorado; and the third on the Henrys' Like National Forest, near St. Anthony, Idaho.

The investigations in wood preservation by the use of creosote, which is nothing more than the dead oil of coal tar, and zinc chlorid, are considered of such importance by the government that one branch of a bureau in the Department of Agriculture—the "Office of Wood Preservation" in the Forest Service—is given over entirely to the work of experiments in coöperation with railroad companies, mining corporations and individuals who desire to prolong the life of the timber which they use. Advice and practical assistance is furnished all who request it of the Forester at Washington.

WHAT FORESTRY HAS DONE.

The following extracts are reprinted from Circular 140, Forest Service, U. S. Department of Agriculture.

INTRODUCTION.

Many people in this country think that forestry had never been tried until the Government began to practice it upon the National Forests. Yet forestry is practiced by every civilized country in the world, except China and Turkey. It gets results which can be got in no other way, and which are necessary to the general welfare. Forestry is not a new thing. It was discussed two thousand years ago, and it has been studied and applied with increasing thoroughness ever since.

The principles of forestry are everywhere the same. They rest on natural laws, which are at work everywhere and all the time. It is simply a question of how best to apply these laws to fit local needs and conditions. No matter how widely countries may differ in size, climate, population, industry, or government, provided only they have forests, all of them must come to forestry some time as a matter of necessity.

The more advanced and progressive countries arrive first and go farthest in forestry, as they do in other things. Indeed, we might almost take forestry as a yardstick with which to measure the height of a civilization. On the one hand, the nations which follow forestry most widely and systematically, would be found to be the most enlightened nations. On the other hand, when we applied our yardstick to such countries as are without forestry, we could say with a good deal of assurance, by this test alone, "Here is a backward nation."

A singular and suggestive exception is England, which, though provided with mountain and heath lands capable of producing a large part of the wood for home consumption, has, with strange indifference, been leading all nations in volume of wood imports

and depending mainly upon foreign sources for her supplies. England has hitherto been able to count with certainty upon outside aid from such near neighbors as Norway and Sweden. This policy has seemed satisfactory to the people in spite of the examples of a more provident policy afforded by rival nations almost at her door. The geographical and economic position of the country have permitted the government, for the time at least, to ignore measures found necessary for the public welfare in other countries of the same rank.

The countries of Europe and Asia, taken together, have passed through all the stages of forest history and applied all the known principles of forestry. They are rich in forest experience. Their lessons of forestry were brought home to them by hard knocks. Their forest systems were built up gradually as the result of hardship. They did not first spin fine theories and then apply those theories by main force. On the contrary, they began by facing disagreeable facts. Every step of the way toward wise forest use, the world over, has been made at the sharp spur of want, suffering, or loss. As a result, the science of forestry is one of the most practical and most directly useful of all the sciences. It is a serious work, undertaken as a measure of relief, and continued as a safeguard against future calamity.

Roughly, those countries which today manage their forests on sound principles have passed through four stages of forest experience. At first the forests were so abundant as to be in the way, and so they were either neglected or destroyed. Next, as settlements grew and the borders of the forest receded farther and farther from the places where wood was needed and used, the question of local wood supplies had to be faced, and the forest was spared or even protected. Third, the increasing need of wood, together with better knowledge of the forest and its growth, led to the recognition of the forest as a crop, like agricultural crops, which must be harvested and which should therefore be made to grow again. In this stage silviculture, or the management of the forest so as to encourage its continued best growth, was born. Finally, as natural and industrial progress led to measures for the general welfare, including a wiser and less wasteful use of natural resources, the forest was safeguarded and controlled so as to yield a constant maximum product year after year and from one generation to another. Systematic forestry, therefore, applied by the nation for the benefit of the people and practiced increasingly by farsighted private citizens, comes when the last lesson in the school of forest experience is mastered.

The United States, then, in attacking the problem of how best to use its great forest resources, is not in the position of a pioneer in the field. It has the experience of all other countries to go upon. There is no need for years of experiment with untried theories. The forest principles which hundreds of years of actual practice have proved right are at its command. The only question

is, how should these be modified or extended to best meet American conditions. In the management of the National Forests the Government is not working in the dark. Nor is it slavishly copying European countries. It is putting into practice, in America, and for Americans, principles tried and found correct, which will insure to all the people alike the fullest and best use of all forest resources.

In the following short history of what forestry has done in other countries, it will be possible to give only the chief facts. Yet even in this incomplete review two things stand out with striking clearness. ONE IS THAT THOSE COUNTRIES WHICH HAVE GONE FARTHEST IN THE PRACTICE OF FORESTRY ARE THE ONES WHICH TODAY ARE MOST PROSPEROUS, WHICH HAVE THE LEAST PROPORTION OF WASTE LAND, AND WHICH HAVE THE MOST PROMISING FUTURES. THE OTHER IS THAT THOSE COUNTRIES WHICH SPEND MOST UPON THEIR FORESTS RECEIVE FROM THEM THE GREATEST NET RETURNS.

SWITZERLAND.

In Switzerland, which has 2,000,000 acres, or 20.6 per cent. of its area, in forest, the communal forests are the largest, and make up 67 per cent. of the total; the cantons own 4.5 per cent., and private persons own 28.6 per cent. The communal holdings are constantly growing by the purchase of private lands. The general government, or Bund, owns no forests. From $6,000,000 to $8,000,000 worth of wood (300,000 tons) and wooden ware are annually imported. This comes mainly from Austria-Hungary, southern Germany, and France.

The State forests yield about 64 cubic feet per acre, the corporation forests 42 cubic feet; the average yield of both together is about 45 cubic feet. The average wood growth per acre has been estimated to be 50 cubic feet. In the State forests of Bern the figures show a growth of 50 cubic feet for the plateau country, 73 cubic feet for the middle country, and 75 cubic feet in the Jura. Wood prices, which are higher than in Germany, have been rising for forty years.

The expenditures in forest management vary greatly among the Cantons, ranging from $1.50 to $7 per acre. The net annual returns range from $3 per acre in the forests where least is expended, to $8 or $9 per acre in the city forests, where most is expended.

Forest regulations came very early in Switzerland. The first forest ordinance of Bern was issued 600 years ago. The city forest of Zürich, famous as the Sihlwald, has been managed under a working plan since 1680, and is today one of the most perfectly managed and most profitable forests in the world. It yields,

on the average, a clear annual profit of $12 per acre. From time to time, as the evidence shows, the Swiss people stood in dread of a timber famine. Ordinances were passed forbidding the reduction of the forest area, the making of clearings, and the exportation of wood from one Canton to another. In the middle of the eighteenth century, as modern industrial life began, various Cantons sought to follow the examples which Bern and Zürich had set in forestry. A severe flood in 1830 brought home the need of more vigorous measures in guarding against torrents. The floods of 1834 and 1868 further enforced the lesson. An investigation of Swiss forest conditions was ordered by the Bund in 1857, and the same year provision was made for an annual appropriation of $2,000 to the Swiss Forestry Association for engineering and reforesting work in the Alps. In 1871 the Bundesrath was empowered to carry on this work, with an annual appropriation of $20,000. After the flood of 1868 $200,000 of the collections made for the relief of the sufferers was devoted to reforestation. In 1876 the Bund assumed supervision of the water and forest police in the High Alps above a certain elevation, and undertook to give aid in the work of engineering and reforesting for the control of the Alpine torrents. Since 1898 the Bund has supervised all this work, and in 1902 the present forest policy was firmly fixed by a revision of the existing law.

All the Swiss forests comprised in the Bund are now classified as protection and nonprotection forests. Whether public or private they are all controlled by the government. In protection forests all cuttings must be such as to preserve the protective value of the forest cover intact, and for this reason clean cutting is usually forbidden. In such forests stumpage sales are forbidden, and all wood must be felled and measured under the direction of a forest officer. Otherwise, privately-owned protection forests are supervised in the main as are those publicly owned. Nonprotection forests are also subject to a number of regulations. When they are in private hands clearings may be made only with consent of the Canton, logged areas must be reforested within three years, and existing forest pastures must be maintained.

Where protection forests can be created by planting, this may be ordered, and where forests are converted to farming land or pasture an equal area may be ordered reforested. Where barren ground is required to be forested for protective purposes, the Bund assists by paying from 30 to 50 per cent. of the cost. Between 1876 and 1902 16,000 acres were reforested at a cost of $1,000,000, in round numbers, the Bund having paid one-half.

Grazing has been regulated for centuries. In protection forests it is entirely prohibited; but on all the rest of the forests great success has attended the efforts of the forest service to safeguard both pasturage and the forest by supervision and range improvement. Despite differences in local conditions, the experience in Switzerland in forest grazing is, therefore, strongly in

support of the policies which are directing the efforts of our own Forest Service. Indeed, the experience of all Europe shows the necessity of controlling the public range.

To sum up, forestry in Switzerland, where every foot of agricultural land is of the greatest value, has made it possible for the people to farm all land fit for crops, and so has assisted the country to support a large population, and one that is more prosperous, than would be the case if the valleys were subjected to destructive floods. In a country as small as Switzerland, and one which contains so many high and rugged mountains, this is a service the benefits of which can not be measured in dollars. It is in Switzerland also, in the Sihlwald, that forestry demonstrates beyond contradiction how great a yield in wood and money it may bring about if applied consistently for a number of years.

[To be continued.]

EROSION.

We have allowed erosion, that great enemy of agriculture, to impoverish and, over hundreds of square miles, to destroy our farms. The Mississippi alone carries yearly to the sea more than 4,000,000,000 tons of the richest soil within its drainage basin. If this soil is worth a dollar a ton, it is probable that the total loss of fertility from soil-wash to the farmers and forest-owners of the United States is not far from a billion dollars a year. Our streams, in spite of the millions of dollars spent upon them, are less navigable now than they were fifty years ago, and the soil, lost by erosion from the farms and the deforested mountain sides, is the chief reason.—*Gifford Pinchot.*

BLUE GUM STUMPS.

A gentleman living near Claremont bought a piece of land five years ago having thereon 47 blue gum stumps from which the trees had recently been cut. At the end of five years (a few weeks ago) he had the second growth cut into cord wood. The crop was 66 cords and sold at $11 per cord, cost $4 per cord to work up or $7 per cord net, a total net income from 47 trees of $462 or nearly $10 per tree. Can you beat it with any other crop the land is capable of bearing?—*The Rural Californian.*

THE HAWAIIAN

FORESTER & AGRICULTURIST

Vol. V JUNE, 1908 No. 6

The inauguration of various local improvement clubs in and around Honolulu some time ago, resulted in very conspicuous good, and localities which formerly had been both unsightly and productive of unhealthy condition, were in many cases transformed into attractive garden plots. It is to be hoped that the energy which was then kindled will not be allowed to wane, although at present there seems a great disposition on the part of some of the organizations to rest content on the good work which was achieved in the first months of enthusiasm. The work of improving a city, and of beautifying its streets and public gardens, can from the nature of things never be finished, but requires as constant and as intelligent application as must be bestowed upon the management of a farm or business enterprise.

Of late perhaps the most conspicuous "improvement" work is being carried out in the Punahou and Manoa section of Honolulu, where avenues of shade and flowering trees have been established, neglected lots have been made presentable and many minor advances have been made. This beautiful suburb of Honolulu appears to be particularly fortunate in the assistance of residents who not only possess the necessary knowledge and good taste but are ready themselves to carry out projects for increasing the beauty of their neighborhood. As a particularly effective instance of the work which has been done in this direction, the transformation of the neglected school lot near the Punahou entrance into a delightful lawn, surrounded by pleasing flower beds, is to be commended.

The near arrival of the largest number of visitors who have ever together landed at Honolulu, should stimulate our local improvement societies into new life. A general movement in the lines of removing weeds from street gutters and between car lines, in clearing up disused lots and in the removal of all unsightly rubbish will do much to convey an impression of order, neatness and beauty, which will later be diffused in thousands of homes on the mainland and do much for the promotion of the interests of the islands.

A general reluctance is felt in attempting to forecast the advent of more prosperous times than has been the lot of this Territory for some years. Still with the present indications of agricultural prosperity it is not difficult to gauge with some degree of accuracy the measure of the tide of success which has set in. In the face of reduced sugar yields in other countries, Hawaii is not only turning out her predicted crop, but is on the majority of plantations greatly exceeding estimates. The coincidence of a record harvest with high prices is a most fortunate one, and its effect is already beginning to be shown in the increased dividends of the plantations. The increasing extension of the pineapple industry, the building of new canneries, the development of new centers of agriculture activity in various parts of the islands, and the projected establishment of tobacco and other plantations are all gratifying signs of the splendid future which is awaiting the Hawaiian Islands. When we are able to look back upon the present year, there is little doubt that 1908 will be regarded not only as one of the most successful years from the material view of revenue, but on account of the inception of many industries and projects which will rank high in the economical future of the Territory.

A Chinese vegetable gardener, named Wing Hop, who, many years ago, is reported to have been employed by Luther Burbank, is now said to have immortalized himself by producing an odorless onion. It is supposed the idea was conceived from a chance remark made to him by Burbank that a fortune awaited the producer of such a culinary delicacy. Many have examined the latest addition to our growing list of modern agricultural triumphs and all report that the new onion is lacking not only in smell but also in the endeared odor of yore. Whether an onion, such as is described is still an onion, is a question the proof of which remains in the eating.

ASSISTANT ENTOMOLOGIST WANTED.

The Australian Sugar Producers' Association is instituting an investigation of the 'grub' which causes great destruction to the cane throughout Queensland, with a view to discovering some specific to adequately cope with it. The special work will be under the direction of the Government Entomologist and Vegetable Pathologist, Mr. Henry Tryon, and it will be necessary for the Government to appoint an Assistant in the Entomologist's

office, which position is now open. Enquiries have been made from Australia of the Hawaiian Forester and Agriculturist to recommend a candidate for the post which will be worth about £250 per annum. If any suitable applicant will notify the Editor fuller particulars will be given.

THE SOY OR SOJO BEAN.

Like the cowpea, the Soy Bean is a hot weather plant. It has much adaptation for localities that are warm and dry. When once rooted it withstands the effects of hot winds and drought. It can be successfully grown on poor soils, like other leguminous plants; it may be turned to good account as a renovator of the soil. Some varieties of the plant will grow to the height of four feet, and produce a large yield of green food, and the plants, laden heavily with pods, which mature seeds, are food for both man and beast.

Like other cultivated plants, the soy bean succeeds best on a rich vegetable soil with a porous subsoil, but it makes fair growth on poor, sandy soils. When the soil needs fertilizing with superphosphates and nitrate of soda, if incorporated with the soil, fifty pounds to the acre will render much benefit. The time for sowing the seed is when the weather is warm. The seed is best sown in drills thirty inches apart, at the rate of four pecks to the acre. If grown for pasture it can be sown broadcast, when more seed would be required. For hay-making the soy bean should be cut, when the beans in the pod are fully half-grown, before the lower leaves begin to fall. It is an excellent soiling plant, since it produces a large yield of green food per acre, and very rich in quality."—*American Farmer.*

COAL AND IRON.

"'The nation that has the coal and iron rules the world.' Bountiful nature has dowered the American people with a heritage of both coal and iron richer by far than that of any other political division of the earth.

What accounts can we, as a nation, give of our stewardship of such vast fuel treasures? Have we carefully conserved them and transmitted the remainder unimpaired to succeeding generations? Or have we greatly depleted this priceless heritage of power and comfort and source of world influence by criminal waste and wanton destruction?

The answer should bring a blush of shame to every patriotic American."—*Dr. White.*

BOARD OF AGRICULTURE AND FORESTRY.

Division of Entomology.

DIVISION REPORT FOR MARCH, 1908.

Honolulu, Hawaii, April 1, 1908.

To the Honorable Board of
Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—Herewith I have the honor to report upon the work of this Division during the month just past.

INSPECTION.

The 36 vessels that reached this port from outside the Territory were boarded by us and found to have brought a total of 13,256 parcels, of which 154 came in the mails, 13,080 as freight, and 22 as passengers' baggage. They were inspected in the usual manner and disposed of as follows:

INSPECTION FOR MARCH, 1908.

Disposal.	*No. of Parcels.*	*Causes.*
Burned	14	Insect and disease infested.
Fumigated	25	Either as a precaution or against living insects.
Threw overboard	1	Fruit from prohibited country.
Ordered returned	792	Scabby potatoes.
Passed	12,434	Free from possible pests.
Total inspected	13,256	

SCABBY POTATOES.

I beg to call your attention to the large number of potatoes (792 sacks) we were obliged to order returned because of excessive infestation with potato scab. Since we were informed by a competent plant pathologist that there is no telling where this disease would draw the line your Inspector has decided to exclude scabby potatoes from the Territory, or rather he was led to conclude that potato-scab is one of the plant diseases "liable to become injurious" and as such should not be admitted into the Territory.

STEAMSHIP AGENCIES RE-INSPECTION.

It was found necessary in course of the month to communicate with the steamship agencies in this city and bring to their attention various points of the law relative to inspection which seemed to have been overlooked by some of their officers. More detailed information, with suggestions as to remedies, were rendered to your Committee on Entomology.

INSPECTION LAW AT HILO.

Bro. Matthias Newell, the Board's Entomological Inspector at Hilo, has for some time past been complaining of the abuses of the inspection laws and disregard of his instructions by a number of the concerns involved in the process of importation. In response he has been supplied by this office with a number of copies of our circulars expounding the laws and regulations of inspection. He has also been offered some suggestions on the *modus operandi* to avoid the difficulties complained of. His latest report is that all obstacles have been removed and he is satisfied nothing enters via port of Hilo without being inspected.

ROUTINE AND OTHER WORK.

ENTOMOLOGICAL LECTURES.

It was my privilege in course of the month to deliver two evening lectures at our newly organized College of Agriculture. "Scale Insects" and "Beneficial Insects" were the two subjects dwelt upon. I was fortunate to be supplied with lantern slides so that both lectures were well illustrated. It is gratifying to know that the Acting Dean of the College was sufficiently well pleased with the lectures to express his appreciation in writing.

ENTOMOLOGICAL EXHIBIT.

In order to make more room for the growing entomological library it was found necessary to transfer the entomological exhibit which was lodged on the Division library shelves. The exhibit was placed in the Board's Museum where it is believed more people will see it and benefit by it.

SCALE-EATING LADYBIRD.

From among the four species of beneficial insects received from Mr. Koebele some time ago and reported to the Board we succeeded in releasing very few of one of them, the remainder of that species having died and no further laboratory breeding is carried on; another is still alive and feeding, but as yet no young

brood was observed; the third is a ladybird that feeds on a well known scale bug. It was some time before a young brood made its appearance, but a few weeks ago it was recognized and comparatively large numbers are now being fed in the laboratory. Finally the fourth, one that I want to speak of particularly, was the first to produce a large number of young on the food supplied them. It was sent by Mr. Koebele under the name of *Azya luteipes* from Mexico where he found it feeding on the group of scale bugs known as "brown" scales or Lecaniids. This is a group of scale pretty well taken care of by natural enemies with which Mr. Koebele has stocked the country during the past fifteen years. Nevertheless, we succeeded in locating a large colony on which to feed the ladybird. It does not seem to be fastidious about the species, provided it is one of those that, until about five years ago, was grouped under the genus Lecanium. We have fed the ladybird on *Coccus longulus, Saissetia hemisphaerica, S. nigra* and *C. acuminatus*. About 100 specimens in the larval and adult stages were released in various portions of the city. At the earliest opportunity a colony will be sent to Bro. Matthias Newell for location in Hilo, since he would know a Lecanium colony when he sees it. As to the other islands, while we should be very glad to send colonies we will have to depend upon some resident to send us specimens of what he thinks is one of this group of scale bugs and if his surmise is correct and the strength of the scale colony justifies it a colony of the ladybird will be sent him.

SCUTELLISTA PARASITE.

The Board will doubtless be interested to learn that we have recently discovered a large colony of Scutellista (*S. cyanea*), that efficient enemy of "Black" scale in California. This parasite was introduced into the Territory in 1905, bred in confinement for a while and then released in considerable numbers by Mr. Craw and the writer, principally upon our Hibiscus black scale (*S. nigra*). Now it has been bred in large numbers out of the Hemisphaerical scale on Ixora and has also been observed on the black scale mentioned.

RECORD OF FRUIT AND VEGETABLE IMPORTS.

By consent of Mr. Craw, Mr. C. J. Austin, the former Inspector's Assistant, started some three years ago to keep record of the number of parcels of each fruit, plant and vegetable brought into the Territory. I am not aware that any use has been made of these very interesting data, but it seemed worth while to keep them up and under instructions from Mr. Craw we drew up and had printed 500 copies of the Fruit and Plant List, a blank copy of which I present herewith for your perusal. Aside from the

direct service of this table it is very useful indirectly as a check upon the data given in the Entomological Inspection Sheet, a copy of which was appended to my February report.

Respectfully yours,

JACOB KOTINSKY,
Assistant Entomologist.

DIVISION REPORT FOR APRIL, 1908.

Honolulu, Hawaii, May 1, 1908.

To the Honorable Board of
Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—Herewith I have the honor to report upon the work of this Division during April.

INSPECTION.

Thirty-one vessels reached this port from outside the Territory during the month and were boarded by your Inspectors. These were found to have brought 94 parcels in the mails, 8,300 as freight and 15 as baggage, giving a total of 8,409 parcels of live vegetable matter requiring inspection. They were all carefully examined and disposed of in the following manner:

INSPECTION FOR APRIL, 1908.

Disposal.	*No. of Parcels.*	*Causes.*
Fumigated with Cyanide	3	Largely precautionary.
Ordered returned or destroyed	100	Scabby potatoes; one lot from Puget Sound fearfully so.
Passed as free from pests	8,306	
Total inspected	8,409	

POTATOES.

It was a pleasure to observe the practical freedom from scab of the potatoes that arrived during the month; while in March out of 5,757 parcels of potatoes consigned to Honolulu 792 had to

be returned, in the month covered by this report out of 4,251 parcels only 100 were ordered returned. Of this 100, 50 came on the "Mexican" from the Sound and were fearfully scabby. The shippers seemed to have been aware of the inferiority of the shipment for they instructed their local consignees to have the shipment destroyed here.

INSECT IMPORTATIONS.

Four lots of live insects were received during the month. Three of them were for the Hawaiian Sugar Planters' Association, namely, one from San Francisco and two from the Orient. In order to dispatch their reaching their destination these insects come addressed to the Superintendent of this Division. Thanks to the extreme courtesy of the customs and steamship officials no time is lost in the transfer here, and thus the two cages of live insects brought by the "Korea" were in the Experiment Station an hour and a quarter after the ship's docking. The fourth lot was addressed to Mr. Craw and contained a colony of the Smyrna fig insect (*Blastophaga grossorum*), kindly sent by Dr. Roeding of the Fancher Creek Nurseries, California.

SMYRNA FIG INSECT.

As the Commissioners are doubtless informed this insect is essential for the production of perfect Smyrna figs. The fruit of the Symrna fig contains female flowers only and unless the majority of these is fertilized the fig lacks the characteristic nutty flavor of the Smyrna fig formerly produced only in that country, now also in California. The male flowers are borne on separate trees known as Capri trees and the pollen from these is transported to the Smyrna fig by the *Blastophaga*. This insect in its native home, as well as in California now, breeds normally within the figs produced by the Capri or male tree. In the spring or about the time the Smyrna fig has attained a certain stage of development large numbers of impregnated females issue from the over-wintering fruit, called Mamme, on the Capri-fig trees, their bodies more or less smeared with pollen, and enter the Smyrna figs. While within the fruit searching for a place to oviposit they fertilize a large number of the female flowers which results in the production of a large number of seeds, thus giving the Smyrna fig its very much relished flavor.

Dr. Roeding sent us six Mamme figs infested with *Blastophaga* and wrapped in tissue paper. This paper when unwrapped, in the majority of cases, contained a large number of dead *Blastophaga* of both sexes; one of the figs was badly molded. Time did not permit to ascertain whether any of the insects were living and not wishing to take chances they were immediately placed where they had the best available opportunity for propagation. Some three

years ago the Moanalua Gardens imported, at the suggestion of this office, fig trees of both kinds from Dr. Roeding's Nurseries. When the insects were taken there on the 16th fruit was found on both kinds of trees. It was rather scarce on the Capri trees and what seemed to be the Profichi crop (spring crop) was about reaching maturity. The letter of instructions that accompanied these insects reached us the following day and it was gratifying to note that the instructions therein given correspond almost exactly with what had already been done with the insects. My connection with the Federal Bureau of Entomology at the time the insect was introduced into California and the little work that I did there in connection with it stood me in good stead in the present introduction. Dr. Roeding was written to and thanked heartily for the shipment and in accordance with the encouragement in his letter another colony was asked for.

OTHER DISTRIBUTIONS.

During the month we have also distributed five colonies of the Arizona Dung-Fly Parasite (*Eucoila impatiens*), one colony of the "Brownie" ladybird (*Cryptolaemus montrouzieri*) and five colonies of *Azya luteipes*. The last is the voracious eater of Lecanium scales referred to in the Division report for March.

LECTURE.

At the request of and by arrangement with Mr. V. McCaughey, Natural History teacher at the Normal School, a lecture illustrated with specimens and apparatus to a class of about 40 on the subject of "Scale Insects" was given in the Board's Library room on the 28th of the month.

MANILA MANGO IMPORTATIONS.

In course of discussion of this subject with Messrs. Holloway and MacIntyre it was suggested that the inspection of those plants and soil upon arrival from Manila would be made more efficient, without endangering the entire impotration, if one plant in each cage, from random selection by the Inspector, be sacrificed for the purpose. Mr. MacIntyre agreed to the arrangement. On the 13th of the month I visited Moanalua and inspected the six cages and soil Mr. MacIntyre was to take with him. A few millipides (*Julus* sp.) were the only living arthropods found in the soil. A few instructions were given Mr. MacIntyre on making the cages absolutely secure against the entrance of possible pests and when the Gardens were again visited three days later it was found those instructions were carried out.

PINEAPPLE FUMIGATION.

In accordance with the promise made in the letter of your President to pineapple shippers in the Territory detailed instructions for the fumigation of plants or fruits were drawn up and distributed to those that asked for them. At the suggestion and with the coöperation of Mr. Byron O. Clark, a "Fumigation Certificate" was drawn up in the event of the San Francisco Inspectors requiring and honoring it. A copy of this certificate is appended herewith.

STAFF.

By permission of the Board the Inspector's Assistant, Mr. G. Allison Jordan, sailed for a tour of the Orient on the 21st to return about July 7th. To substitute him in his absence he left Mr. R. W. Smith.

Respectfully yours,

JACOB KOTINSKY,
Assistant Entomologist.

USES OF TAMARIND SEEDS.

The Indian *Agricultural Ledger* (No. 2, 1907) contains a paper dealing with the composition and uses of the seeds of the Tamarind (*Tamarindus indica*), a well known tree in the West Indies.

Analysis shows that the kernel remaining after the removal of the brown covering is rich in nutritive constituents. These kernels contain 18.06 per cent. albuminoids, 6.6 per cent. fat, and 62.88 per cent. carbohydrates. They have no disagreeable odor or taste.

Tamarind seeds are consumed as a food by the natives in certain parts of India, notably in the Madras Presidency and Central Provinces. For this purpose the outer skin is removed by roasting or by boiling in water, and the kernels are roasted and then ground into flour. This flour is, either alone or mixed with rice or other cereal flours, made into cakes for food. Disagreeable effects which sometimes follow eating these seeds are stated to be due to the fact that the husk has not been entirely removed. The tannin and fibrous matter of this husk are likely to produce unpleasant results.

In some districts of India tamarind seeds are regarded as having medicinal properties, and are given as a remedy for certain disorders.

Another useful property of the seeds of the tamarind is due to the fact that the powdered seeds boiled in a small quantity of water make a tenacious glue or size, which is used by woolweavers, saddlers, and book-binders. This is used to dress country-made blankets.—*The Agricultural News,* Barbados.

HOW TO FUMIGATE PINEAPPLES WITH HYDROCYANIC ACID GAS.

OUTFIT.

1.—Air tight compartment large enough to hold a lot of pineapples most convenient to the shipper. This compartment should have an opening at one side which makes the room air tight when closed. To provide for more rapid ventilation it is advisable to have another opening on the side opposite to the door, preferably near the ceiling of the chamber, also air tight when closed. Both doors should be arranged to open outwardly and from without.

2.—1 1-gallon crock.

3.—1 16 oz. graduate.

4.—1 postal scale.

5.—Potassium cyanide, 98% pure. (Take none other.)

6.—Sulphuric acid, commercial.

7.—Water.

OPERATION.

In arranging the fruit in the fumigating chamber bear in mind to provide ample space for the crock so that, should sputtering take place in course of the chemical reaction, none of the chemicals drop onto the fruit. After depositing the fruit in the chamber weigh and measure out the chemicals in the following order and proportion for each 100 cubic feet of space in the chamber and pour into the jar (a) Water, 4 oz. liquid; (b) Sulphuric acid, 2 oz. liquid; (c) Potassium cyanide, 1 oz. by weight. (c) Is to be weighed out and broken into pieces about the size of a pea and held in a piece of paper in one hand and the door in the other; when everything is ready quickly drop the cyanide out of the paper into the crock and shut the door. To insure against any one opening it, it is advisable to lock it. Leave the door closed from 45 to 60 minutes, then open for ventilation.

CAUTION.

Bear in mind that the fumes are very poisonous and must under no circumstances be inhaled.

The fumigation chamber, if the ventilation is good, must not be entered before a quarter of an hour has elapsed after opening the door, otherwise not less than half an hour must be allowed for ventilation.

The Potassium cyanide should not be handled with bare hand if the latter is scratched or wounded in any way. Use gloves

or forceps and wash hands with plenty of water as soon as possible.

The Sulphuric acid will burn a hole through anything it touches. None of it must therefore be allowed to drop on hands, shoes or clothes. It is much heavier than water and when poured into the graduate care must be taken that it does not squirt back into the operator's face. Mixed with water it produces heat, hence in mixing the two the acid should always be poured into the water instead of the reverse.

It is advisable to have the fruit perfectly dry during fumigation.

P. S.—A double dose will not injure the fruit, and should be employed where the single dose, whether because of inferior chemicals or some other reason, fails to kill the insects.

PRUNING DECIDUOUS TREES.

The framework of the future orchard tree should be entirely formed when the third years' pruning has been given. Too often no attention is given to this important part of tree training and in other cases the tree is given the proper shape when planted, but here the work is allowed to stop. If we are to have the character of the tree top determined at the third spring, close study and attention as well as work, must be given the young trees each season.

For those who are unfamiliar with the growing trees and plants, the basic principle cannot be too often insisted upon—that most trees and plants must be cut back when planted.

Yearling whips of all sorts of orchard trees are the best to plant. Such trees usually have no branches. Cut them back to a point 13 to 24 inches above where the first branch is wanted. The mere cutting back will induce most of the buds to form branches. If not cut back, usually but a few comparatively weak branches will push out and these near the top. Many trees die outright where this important feature is neglected. The second year, from three to five branches are selected to form the framework of the tree. All the rest are removed. The selected branches should be properly spaced around the stem so as to form a symmetrical, well balanced top. One should constantly have in mind the way the tree will appear when it is full grown.

Apple trees have been particularly in mind in the above discussion, but the principles will apply to all fruit trees. Open centered trees have also been discussed for the reason that they are considered best. If one prefers a tree with a central leader, the training is much the same, except that at the first pruning the uppermost branch is left longer, upon which is developed what amounts to a second top.—W. Paddock in *The Rural Californian.*

WOOD PRESERVATION AND THE PROCESS OF PRODUCING CREOSOTE OIL.

The awakening of the American people to the dangerous destruction of their forest wealth, and the necessity of a wise use of what remains of it is one of the most significant signs of the change of attitude towards the national resources. Undoubtedly, in the future the nation must utilize its forest crop less wastefully, both in the woods and in the mill, and must make provision for future crops; but that is not the only way to prolong the timber supply. If the service of the wood which is used can be lengthened, it will largely decrease the amount of timber which must be cut. And this can be done, by treating the wood with chemicals which will poison the low forms of plant life which attack it and cause it to decay. The growth of timber is slow, and when the dearth of it becomes pressing, a new crop can not be grown quickly enough to prevent a time of severe shortage. Preservative treatment of timber has the advantage, as a remedy, that it can be applied immediately. Its importance is therefore attracting increasing attention.

Many chemicals have been used for the preservation of timber, among them being blue vitrol, corrosive sublimate and chlorid of zinc. The most effective preservative is the substance called "creosote oil," or "creosote." On account of the similarity of the names, many people suppose this to be the creosote obtained from wood, such as can be obtained, refined for medicinal purposes, at the drug stores. But the two are quite different, and should not be confused. The creosote used in wood preservation is obtained from coal, by a most interesting process.

Nearly every city now uses gas for light and fuel, and many people know that this illuminating gas is often made from coal. But the many things besides gas which are obtained in this process are not so well known. It is one of these other products from which is obtained the creosote oil used for wood preservation.

To understand how all these things are produced, it is necessary to know something which the chemists can tell us. Coal, they say, is composed partly of the substance called carbon, partly of compounds of this carbon with the gas hydrogen, which they have named "hydrocarbons." When the coal is heated sufficiently, away from air, the hydrocarbons are driven off in the form of gas. Illuminating gas is made by subjecting coal of the proper kind to this process, which is known as "dry distillation." The coal is put into a long, fire-clay oven, or "retort," shaped much like a giant model of the little cakes which the bakers call "lady fingers," the retorts being about thirteen feet long, two feet wide and sixteen feet deep. A number of these retorts are built side by side, in

three rows, one above the other, the ends of the retorts being supported in a brick wall which also extends around the end of the rows and over the top, and thus entirely encloses the retorts. Fire, from furnaces below, is carried by flues into this enclosure, so that the retorts are entirely enveloped in flame and can be heated to a very high temperature.

The retorts are partly filled with coal, after which they are sealed, so that no air can get into them. They are then heated to a temperature of about 2,100 degrees, Fahrenheit. Under this intense heat almost all the hydrocarbons of the coal pass off, leaving behind only the "fixed" carbon, which comes out of the retort as coke. Many of the lighter compounds distilled off by the heat will now remain in the form of gas when they are cooled to ordinary temperatures, and it is some of these which make the gas finally used for lighting and fuel. But as it comes from the retorts, the gas is like a thick, yellowish-green smoke, and could not be used at all for such purposes. This gas escapes from the retorts into a series of large and costly machines where the lighting gas is cleansed from its impurities, and the different by-products are separated from each other. First are great "condensers," in which the gases are cooled. The cooling condenses the heavier compounds into thick liquids, which are then left behind.

One of the substances later removed from the gas is ammonia, and from such gas works comes the ammonia water which is used in every household. Another important product of the gas making process is the coke which is left in the retort. Every year an increasing number of people use this coke for burning in kitchen stoves, and even in furnaces, instead of coal, for it makes a very hot fire and burns without any smoke.

The heavy, strong smelling, black liquid which is collected in the cooling of the gas is what we know as coal tar. This is an exceedingly complex mixture of substances. From it are obtained not only creosote oil, but most of the dyes which are used now-a-days, perfumes, and even flavoring extracts.

Gas, coal tar and coke are also made in what is known as the by-product coke oven, which is adapted to different objects but is operated on the same principle. Its coal tar is equally as good as the gas-works tar for making creosote oil. In recent years a great amount of gas has been made in the United States by another process, and is known as water gas. This process also produces a tar, which looks much like coal tar and is often difficult to tell from it. But this tar is really derived from petroleum, and does not make a good oil for preserving wood from decay. Wood creosote, with which so many people are familiar, is likewise obtained from a wood tar which is produced by distilling wood. But like water gas tar creosote, wood creosote is not so good for wood preservation as is the coal tar creosote. When

creosote is bought for that purpose, therefore, it should be certain that it is coal tar creosote.

To obtain creosote oil from coal tar the tar is, in its turn, distilled. But this distillation is like that used for other liquids instead of that employed for the coal. The still is heated, and as the heat increases the "light oils" first pass over. Among these is the familiar carbolic acid. This is a powerful antiseptic, but it is not desirable in a wood preservative, for it evaporates so readily that it soon becomes lost from the wood. When a temperature of about 400 degrees has been reached, the distillate is turned into another receiver, and from this point on to 600 or 700 degrees creosote oil is produced. One of the substances which is contained in this mixture is "naphthalene," from which common moth balls are made. Coal tar creosote, thus produced, is the great wood preservative.

The residue remaining in the still after the distillation is "pitch," which is used chiefly in the preparation of roofing felt. In America roofing pitch is the chief end for which tar is distilled. In Europe this is not so true. Now pitch for roofing must be rather soft. Therefore tar distillation is not carried so far in this country as it is in Europe. For creosote oil it would be better if it were carried farther, since the substances which distil at the higher temperatures, in most cases neither evaporate in the air nor dissolve in water as readily as those which distil more easily. Consequently they stay in the wood for a longer time, and protect it correspondingly longer from decay. Much study is being devoted by the United States Forest Service to creosote oil, to determine what its composition should be to give the best results in preserving timber, under different conditions, and how the most desirable creosote may be obtained. The reports of these studies, together with detailed description of the more economical processes of applying the preservatives to wood have been worked into circulars which the government has placed at the disposal of all users of timber and which will be furnished to all who make the request of the Forester at Washington.

TIMBER OWNERS ORGANIZE TO FIGHT FIRE.

One of the most important economic movements of the day about which the general public has yet learned little is the concerted action of owners of timber in different parts of the country in organizing associations to protect their holdings from fire. In the Pacific Northwest, the Washington Forest Fire Association has just elected officers at Seattle and begun work for the year with 3,000,000 acres under its care. The plans include a system of patrol by rangers resembling the work done by the United States Forest Service in guarding against and extinguishing fires.

Organizations of similar kind and for a like purpose are at work in Oregon and Idaho. In the latter State, a portion of the expense is borne by taxation and paid from the State treasury. A western railroad company which holds large tracts of timber has taken steps to guard its property from fire, and during the short time that its plans have been in operation, it has met with most encouraging success.

Similar work is being done on the other side of the continent. Forest owners in Maine have gone to work in the same systematic way to control the forests' great enemy, fire. Like organizations are found in other parts of the country, showing how fully it is now realized that protection against fire is of the greatest importance.

It is safe to say that fires in this country have destroyed more timber than lumbermen have cut. When timber was abundant, the waste passed almost unnoticed, but now that a scarcity is at hand and an actual wood famine threatens in the near future, the owners of forest lands are waking up and taking action to save what is left.

NATIONAL RESOURCES CONFERENCE.

"This conference on the conservation of national resources is in effect a meeting of the representatives of all the people of the United States called to consider the weightiest problem now before the nation; and the occasion for the meeting lies in the fact that the natural resources of our country are in danger of exhaustion if we permit the old wasteful methods of exploiting them longer to continue."—*President Roosevelt.*

NATIONAL POSSESSIONS.

"This nation began with the belief that its landed possessions were illimitable and capable of supporting all the people who might care to make our country their home, but already the limit of unsettled land is in sight, and indeed but little land fitted for agriculture now remains unoccupied save what can be reclaimed by irrigation and drainage.

We began with an unapproached heritage of forests; more than half of the timber is gone.

We began with coal fields more extensive than those of any other nation and with iron ores regarded as inexhaustible, and many experts now declare that the end of both iron and coal is in sight."—*President Roosevelt.*

WHAT FORESTRY HAS DONE.

(Continued.)

The following is reprinted from Circular 140, Forest Service, U. S. Department of Agriculture.

GERMANY.

The German Empire has nearly 35,000,000 acres of forest, of which 31.9 per cent. belongs to the State, 1.8 per cent. to the Crown, 16.1 per cent. to communities, 46.5 per cent. to private persons, 1.6 per cent. to corporations, and the remainder to institutions and associations. There is a little over three-fifths of an acre of forest for each citizen, and though 53 cubic feet of wood to the acre is produced in a year, wood imports have increasingly exceeded wood exports for over forty years, and 300,000,000 cubic feet, valued at $80,000,000, or over one-sixth of the home consumption is now imported each year. Germany's drain on foreign countries are in the following order: Austria-Hungary, 19,750,000 tons; Russia and Finland, 18,000,000 tons; Sweden, 508,000 tons; the United States, 360,000 tons; Norway, 49,000 tons.*

German forestry is remarkable in three ways. It has always led in scientific thoroughness, and now it is working out results with an exactness almost equal to that of the laboratory; it has applied this scientific knowledge with the greatest technical success; and it has solved the problem of securing through a long series of years an increasing forest output and increasing profits at the same time.

Like other advanced European countries, Germany felt the pinch of wood shortage a hundred and fifty years ago, and though this shortage was relieved by the coming of the railroads, which opened up new forests, and by the use of coal, which substituted a new fuel for wood, the warning was heeded, and systematic State forestry was begun. After all, the scare was not a false one, for even today Germany is not independent as regards wood, since she has to import one-sixth of all she uses.

In addition to the wood-supply question, Germany was forced to undertake forestry by the need of protecting agriculture and stream flow. The troubles which France was having with her mountain torrents opened the eyes of the Germans to the dangers from floods in their own land. As a result the maintenance of

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* *According to the kind of wood, a ton is equivalent to from about 500 to about 1,000 board feet.*

protective forests was provided for by Bavaria in 1852, by Prussia in 1875, and by Württemberg in 1879.

Each State of the German federation administers its own forests. All of the States practice forestry with success. The results obtained by Prussia and Saxony are particularly interesting, for they show how forests may be kept constantly improving under a system of management which yields a handsome profit.

The Prussian forests, covering nearly 7,000,000 acres, are made up much as if we should combine the pineries of the Southern States with the forests of some of our Middle Atlantic and Central States. When forestry was begun a great part of them had been injured by mismanagement, much as our forests have been, and the Prussian foresters had to solve the problem of improving the run-down forests out of the returns from those which were still in good condition. They solved it with striking success. Immense improvement has already taken place and is steadily going on.

The method of management adopted calls for a sustained yield—that is, no more wood is cut than the forest produces. Under this management the growth of the forest, and consequently the amount cut, has risen sharply. In 1830 the yield was 20 cubic feet per acre; in 1865, 24 cubic feet; in 1890, 52 cubic feet, and 1904, 65 cubic feet. In other words, Prussian forest management has multiplied the rate of production threefold in seventy-five years. And the quality of the product has improved with the quantity. Between 1830 and 1904 the percentage of saw timber rose from 19 per cent. to 54 per cent.

It is a striking fact in this connection that in the United States at the present time we are using about three times as much timber as our forests grow. If we were everywhere practicing forestry with a resulting improvement equal to that made in Prussia, our forests would be growing as much as we use.

The financial returns in Prussia make an even better showing. Net returns per acre in 1850 were 28 cents. In 1865 they were 72 cents; in 1900, $1.58; and in 1904, $2.50. They are now nearly ten times what they were sixty years ago, and they are increasing more rapidly than ever.

These results have been obtained in Prussia along with almost ideal technical success. When what is wanted is a sustained yield from the forest year by year in the long run, it is clearly necessary to have always a certain number of trees ready to be cut; there must be a proper proportion of trees of all ages. This percentage has been secured and maintained with almost mathematical accuracy.

In Saxony, which has about 430,000 acres of State forests, the increase of cut under forest management, which always means also a corresponding increase in wood produced, has been nearly as marked as in Prussia. The yield rose 55 per cent. between 1820 and 1904, and is now 93 cubic feet per acre—greater than

that of Prussian forests. Since the chief wood is spruce, which yields more saw timber than the average of trees making up the Prussian forests, the increase in the percentage of saw timber in Saxony naturally exceeds the increase in Prussia. It increased from 26 per cent. in 1830 to 66 per cent. in 1904. The net yearly revenue is $5.30 per acre. The yearly expense is $3 per acre.

These figures are in striking contrast with the corresponding one for the United States. We spent on our National Forests last year 9 3/10 mills per acre, and our net revenue from them was less than 7/8 mill per acre.

The rise in prices, felt everywhere, accounts only in part for the increased financial returns from forestry in these two States. For while the prices have not quite trebled, the revenue has been multiplied tenfold.

Other German States, smaller, with better kinds of timber and better market facilities, secure even higher returns. The forests of Württemberg yield a net annual revenue of nearly $6 per acre, and those of several smaller administrations do even better.

A number of the private forests of Germany are managed with great success. As a result of a canvass of 15,600,000 acres of State, municipal and private forests, it was found that the average net revenue per acre, from good, bad, and indifferent land, was $2.40 a year.

What, then, has forestry done in Germany? Starting with forests which were in as bad shape as many of our own which have been recklessly cut over, it raised the average yield of wood per acre from 20 cubic feet in 1830 to 65 cubic feet in 1904. During the same period of time it trebled the proportion of saw timber got from the average cut, which means, in other words, that through the practice of forestry the timberlands of Germany are of three times better quality today than when no system was used. And in fifty-four years it increased the money returns from an average acre of forest sevenfold.

Yet today the forests are in better condition than ever before, and under the present system of management it is possible for the German foresters to say with absolute certainty that the high yield and large returns which the forests now give will be continued indefinitely into the future.

To be continued.

THE PRICKLY PEAR.

The readiness with which the prickly pear grows in these islands is a frequent reminder of the use to which this plant is put in other countries. The Barbary Fig, Prickly Pear or Tuna is the fruit of a species of cactus which is much esteemed in southern Europe and in Mexico, where many cultivated varieties exist and are eaten in large quantities. It is a matter of regret that this fruit is so despised in Hawaii, but it is safe to predict that before long it will find among our edible fruits a place at least as important as that given to the guava. In the northeastern markets of the United States the Prickly Pear is to be found in the fall, being imported from southern Europe. If it is found profitable to pay ocean freight on this fruit, and to go to the trouble and expense of introducing it in a market where it was hitherto unknown, it surely would be worth while to devote some attention to the cultivation of select varieties in Hawaii, where producers would have no freight rate to contend with and would not be put to the difficulty of making its merits known to a people unfamiliar at least with its growth and appearance.

The fruit of the Prickly Pear is, as most readers know, ovoid in shape and of a green, red or purple color, although both its shape and color varies considerably in cultivated varieties. The "Figs," as they are sometimes called, are from one to three inches long and vary from an ounce in weight to upwards of half a pound. They are covered with minute sharp spicules, arranged in clusters over the surface, which are far more sparse upon the better varieties. When the fruit is fully ripe the spines as a rule drop off, but their presence is at all times an annoyance to the unwary gatherer, and great care requires to be exercised not to permit their penetrating the skin, as many a rash experimenter has discovered. The fruit itself consists of a rind enclosing a pulp. The former varies in thickness from one-eighth to one-half inch, bears tufts of minute spines, and is removed before eating. The pulp or edible portion in selected varieties is refreshing, juicy, delicately-flavored, sub-acid and of a very agreeable consistency. The peel is removed easily by slitting the fruit across the top and right down one side, when the pulp is readily picked out.

In Mexico, both wild and cultivated Prickly Pears are marketed and are held in some importance. During the season numbers of women are to be seen in the markets with large baskets of fruit, which is displayed invitingly unpeeled. Each customer is supplied with the long pointed spine of a magney leaf, or some similar implement with which to eat the refreshing pulp.

The ripe fruit is very easily bruised, and great care is required in handling to prevent its deterioration. With care,

however, it can be preserved as well as other marketed kinds of fresh fruit. The dried fruit is a well established article of trade and a number of other products from the Prickly Pear are well established.

PRICKLY PEAR HONEY.

One of the best known products of this fruit is a thick syrup known as "Miel" or "Honey" and a more solid substance called "Queso" or "Cheese." The "honey" is produced by boiling the peeled fruit for a period of about two hours, when the solid contents are strained off and the residue evaporated to the consistency of honey, when it is cooled off in wooden receptacles. When cold it is run into bottles and jars and is said to remain good for an indefinite time.

PRICKLY PEAR COLORING.

A dark purple variety of Prickly Pear yields a brilliant red juice which is used in considerable quantities in Mexico for coloring various preserves. This use of the fruit is also known in Hawaii where it is occasionally used for imparting a pleasing color to summer drinks and sherbets. The value of manufacturing and marketing a fruit coloring matter for confectionery and kindred uses will be appreciated, as none of the objection to chemical coloring agents could be advanced against the juice of the Prickly Pear. No doubt a most successful future awaits the experimenter who first places on the market a stable coloring made from this fruit.

In recent years considerable attention has been paid to this cactus, incited very largely, no doubt, by the production of a spineless variety by Luther Burbank. The use of this new plant as a stock feed on arid lands will probably be largely adopted in the future, and in many ways indications are not wanting to suggest that before long the despised Prickly Pear will obtain an honored place among the economic plants of mankind.

INSPECTOR OF FOREIGN ANIMALS AND BIRDS.

On March 10th, 1908, L. G. Blackman was appointed a Special Inspector of foreign animals and birds for the Territory of Hawaii for the United States Department of Agriculture. According to his appointment 'he is authorized to represent the U. S. Department of Agriculture, to issue permits for the entry of foreign animals and birds, and to decide all questions in cases involving the identity of imported animals or birds as to whether permits are necessary or whether species are prohibited from introduction.'

Persons desiring to introduce foreign wild animals or birds to Hawaii should first make application to the Special Inspector for permission to do so. Application forms are available for this purpose and are procurable either from Mr. Blackman or by application to the proper Custom house officials. In order to avoid delay, if possible, such action should be taken before the arrival of the expected importation. Particulars must be given of the port of entry, the country of origin and the expected date of arrival, besides a description of the number and species of the birds or animals it is desired to introduce. The object of importation must also be stated, as to whether they are to be liberated or kept in captivity, and whether intended for propagation, exhibition or other purposes. In some cases Permits for the introduction of birds or animals will be issued upon receipt of the application form properly filled out, in other instances a special inspection at the steamer or wharf is necessary in order to certify to the identity of certain species, and in some few cases, on account either of actual prohibitive legislation or of anticipated danger to agriculture or other interests, permission to import will be withheld.

It should be remembered that the work of the Federal Inspector deals in general with *wild* animals and birds, to which the above instructions apply. The introduction of domestic animals and birds is controlled by the Territorial Government, under the administration of the Division of Animal Industry of the Commissioners of Agriculture and Forestry. Application for the importation of such species should be made to Dr. V. Nörgaard. In order to effect introduction of *any* animals into the Hawaiian Islands it is necessary, however, to satisfy both Federal and Territorial requirements, where such exist.

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Although tropical agriculture offers splendid opportunities for those who engage in it under proper conditions, there are many enterprises which from the nature of things are not likely ever to repay the expense of endeavoring to start them and which careful foresight would have chronicled beforehand among the list of failures.

Among the most profitable agricultural industries are to be included most of those which look to the satisfying on an established food demand, for the market for such commodities increases arithmetically with that of the world's population. It is also found that as education and the general standards of living advance, the per capita consumption of most food stuffs which are not essentially necessary, increases in geometrical proportion. When such articles of diet require special conditions of climate which confines their production to a small proportion of the world's area compared with the diffused market they have to supply, the potential expansion of such industries as the canning of tropical fruits, the preparation of vanilla extract, the cultivation of cocoa, of coffee and of tea, when engaged in under suitable labor conditions, are well nigh illimitable.

Another class of flourishing agricultural enterprises, whose future is equally as promising as of the food stuffs alluded to, is represented by such industries as the production of tobacco, rubber and camphor, the prosperity of which industries is, as in the case of the former class of food stuffs, dependent upon a rapidly increasing per capita consumption, favorable labor facilities and a restricted area of cultivation.

Generally speaking, when these three elements are present an agricultural industry has every likelihood of succeeding; when one of the elements is uncertain it will be precarious, but when more than one element is not assured the enterprise will be impossible as a financial enterprise. The rapidly increasing per capita consumption of sugar, combined with a relatively restricted area of cultivation, would be unavailing to make this industry a success, were it not for favorable labor conditions, and in proportion as these are unsettled, the industry itself suffers.

Among the group of agricultural pursuits which should be viewed with suspicion as not likely to prove remunerative on an extensive scale, is to be included the cultivation of drugs and medicinal herbs. Of late years many attempts have been made, chiefly through the medium of magazine advertisements, to exploit the cultivation of the Chinese medicine Ginseng. Led on by alluring promises, many small growers throughout the States, have been induced to embark on the production of this drug. In consequence the Chinese demand, which has always been supplied locally, has been many times met and American growers have found it impossible at any terms to dispose of their supply. Thus has been exploded another of the wonderful money-making projects which are continually held out to the public. It is well to regard with close scrutiny any new scheme which, through advertisements, promises wonderful returns, and among such the attempted Ginseng boom has proved a conspicuous failure. Of course, money has been made out of the venture, but it has been on the part of the exploiters who first pointed out the alluring prospect and then generously undertook the distribution of seed.

Another illustration of the misfortune which is apt to overtake the grower of medicinal plants is furnished by the experience of the attempt to produce Quinine in California. The extensive use of this drug and its advancing market value induced many agricultural enthusiasts to advocate its cultivation in apparently favorable parts of California. In consequence of this, extensive planting of the Cinchona plant was carried out in that State about twenty years ago. The industry seemed to promise well, until an unusual fall in temperature stamped out the young plantations. Meantime the price of Quinine had declined rapidly until it is now less than a tenth of its former value. Even had the Cinchona plant flourished in California, the present price of Quinine, taken in conjunction with the labor cost of stripping the bark, renders it certain that not one pound of the drug would have been profitably produced in the United States.

With regard to the attempted cultivation of Ginseng, of the three requisite elements to success, apart from suitable cultural methods, each is either wanting or at least uncertain. The consumption of the drug is chiefly confined to one country and is, so far as known, not increasing; the labor facilities of the attempted new country of cultivation are certainly inferior to those of China; and the area of possible cultivation is well nigh universal. These three conditions in conjunction prevent the growing of Ginseng from being profitable anywhere but in the country of its consumption.

In the case of the attempt to grow Cinchona in California, besides the fact that the climatic conditions alone proved sufficient to stamp out the industry, one of the elements requisite to the success of tropical agriculture was altogether absent and another was uncertain. On the one hand the per capita consumption of

the drug is probably not increasing, and on the other the labor conditions of California cannot in any way enter into competition with such countries as Java, which at present easily supply the world's demand.

Another class of industries which of late years has become precarious on account of the increasing diminution of per capita consumption, is the cultivation of perfumery plants. In this case the synthetic process of the manufacture of chemical perfumes has so improved that in perhaps the majority of cases the artificial perfume is not only equal to the natural, but far less expensive and more staple. The result is that whereas in perfumery growing industries all other elements of success may be present, the decreasing use of the natural perfume has often rendered its production unprofitable. In consequence of this many growers of perfumery flowers in France and other European countries are gradually relinquishing the industry and establishing chemical laboratories for the manufacture of synthetic perfumes.

ALEXANDER CRAW.

At a meeting of the Board of Agriculture and Forestry, held on July 1, 1908, the following resolution was by a rising vote, unanimously adopted:

Whereas, The Commissioners of Agriculture and Forestry of the Territory of Hawaii have sustained a great loss in the death of Alexander Craw, Superintendent of the Division of Entomology;

And, Whereas, The efficient manner in which he administered the duties of his office, has won the respect of all and resulted in lasting benefit to the agricultural interests of Hawaii;

And, Whereas, By his genial and kindly manner he had endeared himself to his associates and all others with whom he came in contact;

Therefore, Be It Resolved, That the Commissioners of Agriculture and Forestry extend to his widow their sincerest sympathy in her great bereavement and that a copy of these resolutions be spread on the minutes and be engrossed with the signature of the Commissioners and presented to her.

OUR LUMBER QUESTION.

"It is a striking fact that in the United States at the present time we are using about three times as much timber as our forests grow. If we were everywhere practicing forestry with a resulting improvement equal to that made in Prussia, our forests would be growing as much as we use."—*U. S. Forest Service Circular.*

MR. ALEXANDER CRAW.

The recent decease of Alexander Craw in California, where he had repaired in the hope of reëstablishing his impaired health, deprives the Territory of a valued and efficient officer and his associates of a sincere and sympathetic friend.

Of Scotch ancestry, Alexander Craw received an horticultural education and early in his career was appointed second in charge of the propagating department of the Royal Nurseries at Ascot, England. He afterwards became manager of the nurseries of Messrs. Martin and Sons, of Cottingham, and after an appointment at San Diego, California, he was for twelve years in charge of the Wolfskill orange and lemon groves. In 1890 he was appointed State Horticultural Quarantine Officer at San Francisco by the State Board of Horticulture. In this capacity he earned an unassailable reputation for his success in combatting agricultural pests by means of their natural enemies. Of this system of checking crop enemies he was for many years the foremost and most successful exponent, and together with such workers as Messrs. Koebele and Compère formed a group of economic entomologists whose labors are exercising a most beneficial influence upon many important agricultural industries.

Chiefly through the indomitable perseverance of Alexander Craw, Albert Koebele was dispatched on a mission to discover a natural enemy to the Cottony Cushion Scale, which was threatening to extirpate the citrus groves of California. As a result of this expedition *Vedalia Cardinalis* was introduced to California, and thus was preserved to the State an industry which has played no mean part in the development of her prosperity. So vigilant and successful was the system of horticultural quarantine inspection enforced that it is believed that during Mr. Craw's term of office no new agricultural pests were introduced to California. With the actual introduction and establishment of the Navel orange to California Mr. Craw had much to do, and his name will forever be associated with the agricultural development of that State.

In 1904 Mr. Craw was appointed Superintendent of Entomology by the Board of Agriculture and Forestry of Hawaii. Since then his energy has been chiefly directed to establishing means of combatting the existant agricultural pests of the Islands and to enforcing quarantine regulation for the exclusion of additional ones. In this work Mr. Craw was most successful and the securing of his services to the Territory has resulted most beneficially to the agricultural operations of Hawaii.

A WORLD'S RECORD IN EGGS.

Not only is South Australia the chief egg-producing and exporting State, but her breeders are among the foremost of the world. In Western Australia, at Subiaco, last year, a team of six White Leghorns, the property of Mr. W. L. Williams, of Sunnyhurst, Clarendon, put up the then world's record of 1,494 eggs. At Gatton Agricultural College this year Mr. A. H. Padman, of Hyde Park, succeeded in putting up the existing world's record to 1,538 eggs from six hens. At Roseworthy a world's record for two pens—over 1,500 eggs for 12 months—was put up by two owners—Mrs. A. E. Kinnear, with 1,531, and Mr. A. H. Padman, with 1,528. These figures are very close to the Gatton total. Mr. Padman has won the contest at Berowra, and is leading at Subiaco. Mr. T. B. Brooks entered for New Zealand last year, and with the help of the birds he supplied to others succeeded in capturing the first five places. He was the winner at Blenheim, with 1,409 eggs to his credit. The day is not far distant when we shall have scores of breeders with birds of this description. The ordinary mongrel hen rarely lays 150 eggs a year, and yet here are two lots of six hens laying £5 6s. worth of eggs in a year, valued at wholesale market rates.—*Journal of Agriculture, S. Australia.*

AN UNUSUAL OPPORTUNITY.

The American Foresty Association, feeling that its duty is energetically to preach to a greater audience the larger gospel of conservation, not only of our forests but of all our natural resources, is offering trial subscriptions to its monthly journal, "Forestry and Irrigation," for six months, for twenty-five cents.

Those who are not already members of the Association should not fail to take advantage of this offer, for from the six numbers that will come to them they will learn much of the aims and spirit of national forest work.

Subscriptions can be sent to the Association, 1311 G. St., N. W., Washington, D. C., or may be handed to Mr. Ralph S. Hosmer, Box 331, Honolulu, to be forwarded.

BOARD OF AGRICULTURE AND FORESTRY.

Division of Forestry.

ROUTINE REPORT.

Honolulu, July 15, 1908.

Board of Commissioners of
Agriculture and Forestry,
Honolulu, Hawaii.

Gentlemen:—I have the honor to submit the following report from the Division of Forestry covering the period from April 1 to date:

By invitation of Governor Frear, it was my privilege to attend the Conference on Natural Resources at Washington in May, as one of the three delegates from Hawaii. Leaving Honolulu on April 22 I arrived in Washington some days before the opening of the conference. This allowed time for a visit to Philadelphia, where Mr. Gartley and I had an interview with Professor John W. Gilmore, of Pennsylvania State College, to whom we tendered the position of President of the College of Agriculture and Mechanic Arts of this Territory. As you know, Professor Gilmore accepted this position and within a short time will be on the ground.

The Conference on Natural Resources was held at the White House from May 13 to 15 and was a very notable gathering. It is unnecessary here elaborately to discuss the meeting or to give abstracts of what was said. The full report given in the June issue of "Forestry and Irrigation" has already been widely distributed throughout this Territory. Enough to say that it was a meeting which will be far-reaching in results.

Perhaps the most impressive feature of the conference was the harmony of opinion in regard to the need and importance of a more rational use of the natural wealth of the nation, and the broad, non-sectional spirit that animated all the speakers. This truly national note was indeed the dominant characteristic of the conference; it argues well for the future.

There is no question but that the Conference on Natural Resources will be the starting point of a number of movements having more or less definitely to do with the conservation of forests and minerals, as well as the systematic development of our inland waterways. The date of the meeting is one that will long be remembered as significant in the history of the nation.

The value of such a conference is by no means confined to the papers to which one listens. Fully as much is gained by meeting workers in one's own profession and discussing with them

technical problems. Especially is this true of one from a station like Hawaii, where from the nature of things he is more or less cut off from professional association. In attendance at the Conference of Natural Resources were several of the State Foresters. From talks with these men and with officials of the United States Forest Service I bring back fresh ideas and information of value to my work here. After leaving Washington it was my good fortune to see and talk with other men engaged in forest work at Trenton, New Jersey, New York, New Haven, Boston and San Francisco.

While in Washington I also made it a point to see various officials of other Bureaus of the United States Department of Agriculture, and of the Geological Survey, bringing to their personal attention certain needs of the Territory. I returned to Honolulu on July 6; since then I have been occupied in getting in touch with the current happenings in forest work and with the routine duties of the office.

Mr. Haughs' reports during my absence have told of the regular work of the Division. With regard to the Library, it gives me pleasure to report the accession of a number of important books. Special mention is to be made of the Atlas of Botanical Plates, by Asa Gray, in the report of Wilkes' Exploring Expedition; "Rumphia," four volumes, plants from the Orient; Horace Mann's "Flora of the Hawaiian Islands"; several books on East Indian botany, and a number of general reference books on forestry, botany and agriculture.

Miss Eleanor B. Wirt terminated her services as special clerk on June 30, after completing various pieces of work for this Division. On May 19 the Hawaiian Poultry Association held a meeting in the Library of the Board.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

NOXIOUS WEEDS.

The following have been gazetted as noxious weeds throughout Western Australia: Stinkwort, Bathurst Burr, Nooguorn Burr, Nut Grass, Spanish Radish, Prickly Pear, Apple of Sodom, Sweet Briar, Wild Bramble, Starr Thistle (purple), Double Gee and Water Hyacinth.

As several of the above weeds are prevalent in Hawaii, an illustrated bulletin which is shortly to be published by the Department of Agriculture of Western Australia, should be of exceptional interest.

Under "The Noxious Weeds Act, 1904," Inspectors are gazetted to carry out its provisions. In a subsequent number we hope to have more available data on this subject.

MR. JARED GAGE SMITH AND HAWAIIAN AGRICULTURE.

The announcement of the resignation of Mr. Jared G. Smith from his appointment as Special Agent in Charge of the Hawaii Agricultural Experiment Station, has been received with regret by all who have been associated with him during his term of office. At the time of Mr. Smith's arrival in Hawaii, the agricultural energy of the islands was chiefly directed to one channel, and those who were engaged in industries other than the cultivation of sugar were generally regarded with indifference, which often amounted to disfavor. By persistently advocating the doctrine of diversified industries as affording the true avenue for Territorial development and prosperity, and by insisting upon the settlement of the land with an intelligent farming population, the work of the seven years of Mr. Smith's incumbency has laid the foundation for an agricultural future, bright with promise to the Hawaiian Islands.

Mr. Smith was an original member of the Farmers' Institute of Hawaii and its President during the first six years of its existence. The assistance and stimulus which the Institute has given to Hawaiian agriculture are incalculable and in no way has this been better demonstrated than in the personality of its first President. Using the word "farm" to represent the home of one earning for himself and his family a living from the soil, it will not be denied that Mr. Smith may be fittingly termed "The Father of Farming in Hawaii."

Among the many agricultural enterprises which have entered during the last few years upon a practical phase, or are about to assert their practicability, there is none with which Mr. Smith has not closely identified himself and given his assistance and encouragement. Although at the present time it is difficult to guage the relative importance of the various fields of his activities, it is probable that it will eventually be proved that the most valuable of his investigations has been the demonstration of the possibility of establishing the cultivation of tobacco in Hawaii. The countries which produce tobacco are essentially wealthy ones, and it may be that Mr. Smith's desire for prosperous communities of farmers throughout the Islands will be very greatly realized by the rapid development of this industry, which it is confidently expected the next few years will witness. In this Mr. Smith has the courage of his convictions, for he relinquishes his work at the Federal Experiment Station in order to establish a tobacco plantation in Hawaii, in which enterprise the Forester wishes him every success.

Jared Gage Smith was born at Springwater, New York, Sept. 13, 1866. He was educated in the public schools of Lincoln, Neb., and received his university training at the University of

Nebraska, receiving the degree of B. S., in 1888, and that of A. M. in 1892. His official record in the profession of agriculture is as follows:

Assistant agriculturist, Nebraska Agricultural Experiment Station, 1888-90; traveled and collected in Europe, Australia and Mexico, 1890-92; collected grasses and forage plants in Western United States, 1892; Associate Botanist, Shaw School of Botany, St. Louis, 1892-93; Assistant Botanist, St. Louis Botanical Gardens, 1893-95; Assistant, Division of Botany, United States Department of Agriculture, 1895; Assistant Chief, Division of Agrostology, U. S. Department of Agriculture, 1895-99; Assistant, Division of Botany, U. S. Department of Agriculture, 1899-1900; Chief, Section of Seed and Plant Introduction, U. S. Department of Agriculture, 1900-01; Special Agent in Charge, Hawaii Agricultural Experiment Station, since March, 1901.

Besides association with other learned societies, Mr. Smith is a member of the St. Louis Academy of Sciences; a Fellow of the American Association for the Advancement of Science; a Member of the National Geographical Society, and an Associate Member of the Botanical Society of America. He is the author of some thirty Bulletins on Grasses, Forage Plants and Range Conditions in the United States, and also of much literature dealing with the promotion of agriculture in Hawaii. His systematic work has been chiefly on Botany, and includes Alismaceae, Gramineae, Sagittaria, Lophotocarpus, Sitanion, Agropyron, and Hordeaceae.

LABOR-SAVING APPLIANCES.

In a summary of data prepared for farmers' wives in connection with the extension work of the New York Agricultural College and Experiment Station, the need for kitchen conveniences is insisted upon. "A clerk does not like a poor pen, a typewriter a poor machine, nor a carpenter a poor saw. So the expeditious cook objects to poor cooking utensils. They are a bar to progress, a menace to the success of her enterprise, and a serious temptation to her serenity of temper. Stirring cake with a small, frail spoon, beating eggs with a loose-jointed egg beater, as well as many other crippling processes, should not be her lot to endure." As the writer quoted points out, the needed utensils cost money, but so do all labor-saving and useful devices, and it is fitting to ask whether the labor-saving devices in the house have kept pace with those purchased for use in the barn or fields. If the farmer's wife and daughters can economize in time and energy required for household tasks they will have leisure for other duties and pleasures and for rest and recreation.

BOARD OF AGRICULTURE AND FORESTRY.

Division of Entomology.

DIVISION REPORT FOR MAY, 1908.

Honolulu, Hawaii, June 1, 1908.

To the Honorable Board of
Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—I have the honor to report herewith upon the work of this Division during the month of May:

During the period covered by this report 34 vessels from outside the Territory reached this port and the live vegetable matter they brought as freight, passengers' baggage and in the mails was subjected to the customary rigid inspection with the following results:

INSPECTION DURING MAY, 1908.

Disposal.	No. of Parcels.	Causes.
Passed as free from possible pests......	10,612	
Ordered returned.....	17	Potatoes with fungus (3), apples (14), wormy and decayed.
Dipped in Bodeaux...	3	(5,000 roots) To prevent introduction of pernicious rust.
Fumigated	35	To kill insects upon plants or seeds.
Burned	11	Rusty peas and wormy turnips.
Immersed in Formalin	19	Seed potatoes.
Total inspected.......	10,697	

FACTS NOTED IN COURSE OF INSPECTION.

Earth Worms.—On the 27th the S. S. Manuka brought a consignment of Orchids from Fiji. In the box were found several live beetles. It was immediately placed in the fumigation chamber and given the usual dose of cyanide. No live insects were found on the plants after fumigation, but in the soil a millipede

and several earth worms were found alive. The soil was therefore carefully removed and dumped overboard.

Apples from Australia.—The same steamer had 40 cases of apples from Sydney consigned to Honolulu. When the ship's officers were reminded of the Board's regulation prohibiting the importation of fresh fruits from Australia, the fruit was not landed here. Your inspector examined the boxes on board and satisfied himself they were sufficiently well covered to prevent the escape of fruit-fly that might have emerged en route.

Delayed Inspection.—The S. S. Virginian arrived from San Francisco late in the afternoon of May 27th and brought, among other things, 12 cases of plants, an unusually large number for one steamer. Upon examination the following morning they were found invaded by a horde of cockroaches (*Phillodromia germanica*). In addition, a number of the cases contained mango and avocado trees from Florida, the former even bearing specimens of a species of Pulvinaria. Fumigation of the entire lot was imperative and Wells Fargo Express Co., to whom most were consigned, as well as their draymen, were notified that the cases need to be transported to the Oceanic dock for the purpose. In view of the fact that the Alameda with her usual heavy cargo of fresh fruit was due next day, the importance of *immediate* transportation, in order to enable us to fumigate and inspect the same day was urged upon the Express people. Notwithstanding our insistence the cases did not reach the Oceanic dock until 3:50 P. M., and by the time the fumigatory was ventilated it was too late to attempt inspection. It transpired later that it was impossible to secure a dray, hence the delay. We were compelled to defer inspection of these plants until after about 150 lots of fresh fruits and vegetables (not counting deck vegetables) brought by the Alameda next day were inspected. Naturally, as it was impossible to foretell what obstacle might present itself in course of this fruit inspection it was equally impossible to make definite promises as to when the work of final inspection of those plants could be undertaken. However, by dint of a supreme effort we succeeded in inspecting all of those plants that very afternoon. Despite the handicap of reduction in inspection force the Division is satisfied that it has attended to the work of inspection promptly and thoroly.

Bordeaux Dipping.—The Alameda of May 29th brought 3 large cases containing 5,000 roots of asparagus for planting purposes. To prevent the introduction of that terrible pest of the asparagus grower on the mainland—Asparagus rust (*Puccinia aspagari*, D. C.)—the plants were dipped in a standard solution of Bordeaux before being passed.

Seed Potatoes.—The same steamer also brought 19 sacks of potatoes consigned to A. W. C., which, it was later ascertained were intended for seed purposes on Hawaii. When this was learned they were removed to the Government Nursery where

each sack was carefully picked over, separating for destruction all those showing traces of disease and the balance was submerged for an hour in a 1½ per cent. solution of Formalin, in order to disinfect them from clinging disease spores. In both cases consignees paid for labor and chemicals.

Rusty Peas.—Some of the green peas reaching this market were found to be heavily infested with a rusty spot, probably "pea-spot" (*Ascochyta pisc*, Libert). Peas so infested were destroyed.

ROUTINE AND OTHER WORK.

W. Australian Entomologist.—Mr. Geo. Compere, Entomologist of the West Australian Department of Agriculture, was a thru passenger from the Orient on the 15th, and much of the day was spent with him. He left here another colony of the Oriental red-scale parasite (*Comperiella bifasciata*, How.), males and females of which were bred out the same day and released on a citrus tree in the Government Nursery grounds infested with this scale. Material was also collected of several of our common parasites of white-fly and scale bugs which Mr. Compere took along for releasing in California. He had much to tell of having successfully introduced fruit-fly parasites into West Australia from India and left specimens of these for identification by Dr. Perkins. As a result of the cordial relations between Mr. Compere and this office we hope to be able to secure some of those parasites as soon as they show their efficiency against melon fly. Meantime results in West Australia will be watched carefully.

Useful Insect Distribution.—Aside from the big collection of various parasites sent to California with Mr. Compere, there were distributed in the Territory 18 colonies of useful insects during the month, to supply some of which it took considerable time to collect.

Pineapple Fumigation.—Toward the end of the month there were numerous inquiries relative to fumigation of fresh pineapples for the coast. Many shippers found themselves wholly unprepared, especially with air-tight inclosures, but one day before sailing. The inspector was called upon and he granted permission to use one of the Board's fumigation chambers for the purpose, and no pineapples left this port without fumigation.

The fumigation formula in universal application prescribes the use of 98 per cent. guaranteed Potassium Cyanide. The grade in the local market was found to be inferior and ineffective against the pineapple mealy bug in several instances when used at the usual rate.

Experiments.—Tests were therefore undertaken to ascertain (1) whether the inferiority of the cyanide was responsible for the inefficiency; (2) whether the 98 per cent. C. P., a few pounds of which were secured, in the usual dose would kill the bugs; and

(3) whether an overdose would injure the pine. The Wahiawa Pineapple Co. kindly supplied the fruit for the experiments. One fruit was treated with a regular dose of the Commercial Cyanide. Two other infested pineapples were treated with a regular and double dose, respectively, of the C. P. grade of cyanide. One fruit, used as a check, was left untreated. In the first instance the mealy bugs were found decidedly alive at the end of the operation. The pines fumigated with the C. P. Grade, in both the usual and double dose, had all the bugs dead after fumigation and the fruit uninjured. Moreover, these two fruits together with the unfumigated specimen remained in a closed box for about two weeks afterwards with interesting results. The two fumigated pines were in an excellent state of preservation, barely showing signs of ripening. Whereas the unfumigated fruit was ripe and almost rotting where most heavily covered with bugs. The evidence, tho by no means conclusive as yet, seems to suggest the probability that fumigated pineapples will stand a longer journey than those not so treated. The experiment needs repetition before definite conclusions are drawn, and seems well worth it.

Staff.—In anticipation of three steamers, including the Alameda on the 8th, it became evident that, unaided, Mr. Smith and I could not attend to the work. With the subsequent consent of your President I enlisted the services of Mr. D. B. Kuhns, a graduate student of the Normal School, for two days. At the lecture I gave to this class in the Normal School Mr. Kuhns has each time impressed me more favorably than the previous as embodying the elements for making a fine naturalist. He has been a member of the Hawaiian Entomological Society ever since its existence became known to him, and eagerly seeks an opportunity to work along natural history lines. I commend him favorably to your attention, should the Board be in need of an assistant.

Respectfully yours,

JACOB KOTINSKY,
Assistant Entomologist.

Many varieties of chillies (*Capsicum annuum*) are grown in Roumania. The young plants (raised in seed-beds) are set out on light soil, in warm positions, at distances of from 10 to 18 inches apart. With the exception of abundant applications of water (which have a great influence on the yield of fruit) and occasional hoeings, the crop receives little attention. The chillies are very popular with the Roumanians, being eaten in the green state and as salads, as well as cooked, and as condiments with meat.—*The Agricultural News,* Barbados.

A VISIT TO MOANALUA.

One of the most instructive of the smaller expeditions which can be made in the environs of Honolulu by the agriculturist is that to the Moanalua, where are situated the gardens and country seat of the Hon. S. M. Damon. Grouped here at the foot of the beautiful valley are found miniature orchards of sub-tropical fruit trees, orchid, fern, palm and rose houses, and all the accessories of an agricultural nursery, wherein is carried on in a practical and scientific manner the propagation of well nigh every economic plant which finds a home in the Hawaiian Islands.

The gardens at Moanalua are under the direction of Mr. Donald MacIntyre, who, to an intimate knowledge of the best gardening methods of his native country of Scotland, has added many years of practical work in sub-tropical horticulture.

An effort is made at Moanalua to make the gardens yield a supply of everything requisite for the table, that can be grown in Honolulu, and to this end, small divisions are allotted to many diversified uses. Here a small cluster of fragrant coffee trees may be seen in bloom, near by an attractive orchard of thrifty papaias are seen loaded with fruit, a little further on is a well protected clump of heavily laden fig trees, and beyond a succession of beds devoted to selected varieties of ripening pineapples. In this way an hour or two spent at Moanalua, is able to give to the visitor a practical demonstration of the possibilities of Hawaiian agriculture which would otherwise take much longer to acquire.

A great feature is made of the propagation of selected varieties of mangoes, and a considerable proportion of the grounds is given over to this purpose. In spite of the prevalence of disease among the local trees, those at Moanalua are all particularly clean and thrifty. This condition is only maintained by constant vigilance, but the splendid appearance of the foliage and the promising indication of the coming crop, amply repay the efforts expended in this direction. The majority of the younger trees are grafted and much work has been accomplished at Moanalua in this and in other methods of propagation.

Mr. MacIntyre has lately departed for Manila, on a trip especially undertaken to procure the introduction of desirable varieties of mangoes. For this purpose, great preparations have been made, for on account of the rigid enforcement of the regulations to exclude exotic plant enemies from Hawaii, special precautions have been necessary. To prevent this the soil in which the new trees will be propagated has been conveyed to Manila, and will there be kept in a specially constructed house until the plants are

Young Grafted Mango, Moanalua.

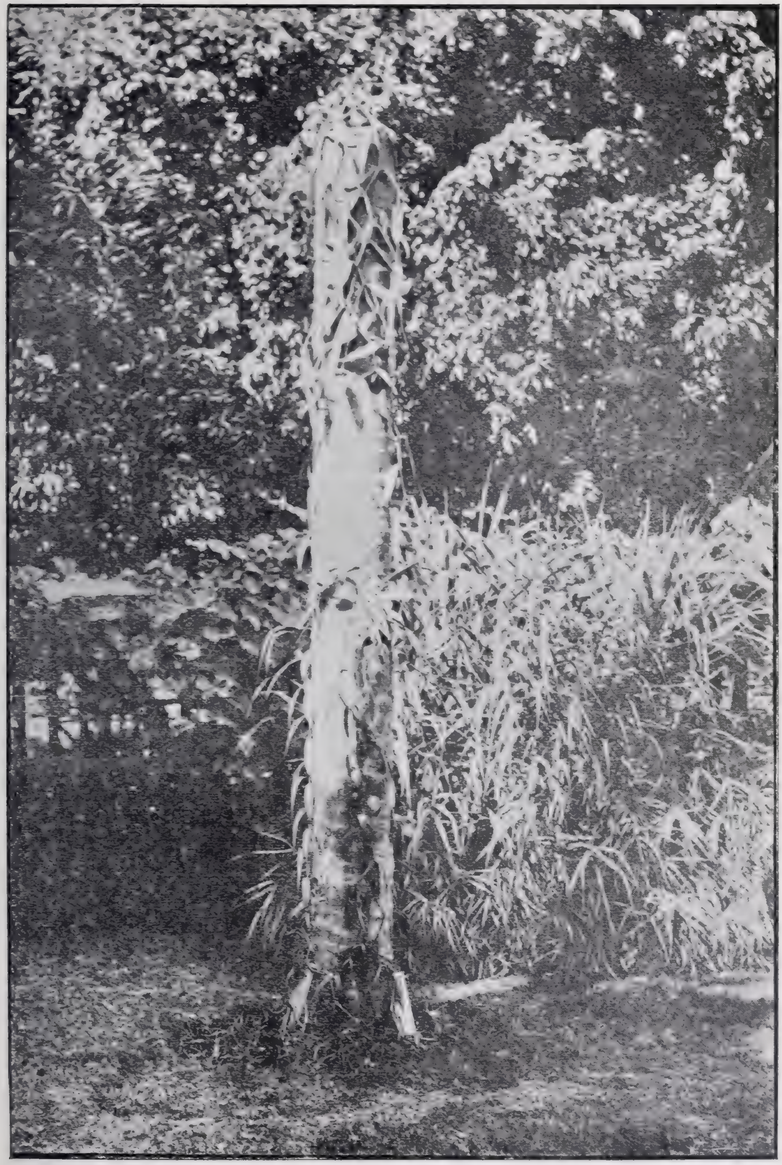
ready for removal. In this manner danger from soil contamination will be avoided, as the importation of soil from other countries is fraught with too much risk to permit of this manner of introducing trees being employed. To convey the young plants in transit and to facilitate their handling a series of cases has been prepared, in which they will be placed. During the journey to Honolulu, upon favorable days, the tops of the cases will be removed, so that the trees should arrive at their destination in excellent condition.

The papaia trees at Moanalua attract attention on account of their sturdy and robust appearance. At present an effort is being made to establish a special variety of this very versatile fruit. The shape of the papaia which is being developed is a particularly attractive one, each fruit being marked with regular and distinct flutings. As all other horticulturists in Hawaii, Mr. MacIntyre has his special theory of the determination of sex in this eccentric tree, and certainly the uniform success with which he secures fruit-bearers gives weight to his ideas on this subject.

The method of keeping the intervening ground between the trees well tilled and free from grass, has produced excellent results at Moanalua, and is one which should be generally followed wherever good crops of fruit are expected. The root systems of nearly all trees are so extensive that it is futile to expect them to derive adequate nourishment and water from a meagre hole encircling the trunk. In order that young orchard trees may grow successfully it is necessary that the elements of plant food are available where they can be appropriated by the wide spreading root filaments. For this reason the ground should be cleared and water and such fertilizer as may be required, distributed wherever the root system extends.

The orchids of the gardens have long been famous and the houses devoted to these plants and to roses, ferns and palms present a beautiful appearance and are exceedingly interesting. The impression left by a visit to Moanalua is a very pleasant one, and the remembrance of well trimmed hedges and lawns, of tastefully arranged orchards of fruit trees and of ornamental foliage and flowering plants will long remain in the memory.

The United States Consul at Valencia, Spain, reports great depression in the Spanish orange-growing industry. Growers have been forced to sell their fruit at prices which, after deducting packing expenses, freight, etc., leave practically no profit whatever. It is stated that Jamaica and Jaffa oranges are more popular than Valencias on the British market, and Spanish oranges are unable to compete with the more favored varieties.—*The Agricultural News*, Barbados.



Vanilla on Coconut Stump, Moanalua.

WHAT FORESTRY HAS DONE.

The following extract is reprinted from Circular 140, Forest Service, U. S. Department of Agriculture.

FRANCE.

France has not quite 18 per cent. of forest—three-fifths of an acre per capita. This is enough to produce only one-third of the home demand. The country imports annually $30,000,000 worth of wood, and pays $6,000,000 duty and $10,000,000 freight for it. This wood comes from Russia, Sweden, Norway, Austria-Hungary, Germany, and America. Of the 23,500,000 acres of French forests the State owns 2,707,000, and the Departments and communes 3,472,000. Since 1827, when the first code was passed, the State and communal forests have been under management. The State forests yield a clear profit of $4,737,250 a year, or $1.75 per acre; $0.95 is spent for the management of each acre every year.

The best managed State forests yield about 40 cubic feet per acre a year, which is low compared with the yield of some other European forests, such as those of Prussia, Saxony, or Württemberg.

The great achievement of France in forestry has been the establishment of protective forests where much destruction had been caused by floods and winds. From various causes large areas were cleared of forests toward the close of the eighteenth century, and only when it was too late was it realized that these lands were not fit for agriculture and should have been left in forest. To repair the mistake, a movement to reforest began in the nineteenth century. It was an exceedingly expensive mistake. Down to the present time, encouraged by wise laws, the State, the communes, and private landowners have restored to forest over 2,500,000 acres, and so saved them from ruin. In addition, the resulting forests return an excellent revenue.

Two-thirds of the torrents of Europe are in France. In the Alps, the Cevennes, and the Pyrenees mountains there are 1,462 brooks and mountain streams which are considered dangerous. Nearly a million acres of mountain slopes are exposed to erosion by these streams, to say nothing of the flat land below.

As far back as the sixteenth century there were local restrictions against clearing mountain sides, enforced by fines, confiscation, and corporal punishment. In the main these prevented ruinous stripping of hillsides, but with the French Revolution these restrictions were swept aside and the mountains were cleared at such a rate that disastrous effects were felt within

ten years. By 1803 the people had become aroused to the folly of this cutting. Where useful brooks had been there now rushed torrents which flooded the fertile fields and covered them with sterile soil washed down from the mountains. The clearing continued unchecked until some 800,000 acres of farm land had been ruined or seriously injured, and the population of eighteen Departments had been reduced to poverty and forced to emigrate. By 1860 the State took up the problem, but in such a way that the burden of expense for reforestation was thrown upon the mountaineers, who, moreover, were deprived of much pasturage. Complaints naturally arose. An attempt was made to check torrents by sodding instead of by forest planting. This, however, proved a failure, and recourse was again had to planting, by the law of 1882, which provides that the State shall bear the cost. Since then the excellent results of planting have completely changed pubiic sentiment. The mountaineers are most eager to have the work go on and are ready to offer their land for nothing to the forest department. In addition to lands secured by gift, the State reclaims 25,000 to 30,000 acres a year. Over 500,000 acres have been acquired and more than one-half of this area has been planted. Already 163 of the torrents have been entirely controlled and 654 are beginning to show the controlling effects of the forest on their watersheds. Thirty-one of the torrents now entirely controlled were considered hopelessly bad a half century ago.

It is expected that $50,000,000 will have been spent before the work of reforesting for protection is complete.

The sand dunes on the coast of France, mainly in Gascony, which the winds drove farther and farther inland, wasting the vineyards. have now largely been fixed in place by forest plantations which were begun in 1793. Of the 350,000 acres of sand dunes 275,000 have been planted in forest, and the dunes, instead of being a constant menace to the neighboring farmers, now are growing crops of pine which produce valuable wood and resin. In all, about $2,000,000 was spent in the work and an additional $700,000 was laid out in bringing the forests under administration. Now, though about one-half of the lands have been acquired by private persons and the State retains only about 125,000 acres, the State has received $120,000 above all expenses, and possesses a property worth $10,000,000, acquired virtually for nothing.

Some 2,000,000 acres of shifting sands and marshes toward the interior of the country, a triangular territory known as the Landes, has been changed from a formerly worthless condition into a profitable forest valued at $100,000,000. Reforestation was begun about the middle of the last century. This work was done principally by the communes, aided and imitated by private owners, and encouraged by the State. The resulting forest pro-

duces both pine timber and resin, upon the yield of which the present valuation is based.

La Sologne, in the central part of the country between the rivers Loire and Cher, was once densely wooded, but was for two centuries steadily deforested. By the beginning of the nineteenth century 1,250,000 acres had been utterly abandoned. Owing to the nature of the soil and subsoil, drainage was necessary as a first step toward reclaiming this land with forest. About the middle of the nineteenth century a committee of private citizens, under the presidency of the director-general of forests, began the work of reclamation. A canal 25 miles long and 350 miles of roads were built, and 200,000 acres of nonagricultural land were planted with pine. In spite of the fact that one of the species planted proved a failure and another kind of pine had to be substituted, the restoration work has resulted in a forest property worth $18,000,000, and land which could be bought for $4 an acre fifty years ago is now yielding $3 an acre net annual revenue.

The arid limestone wastes of the province of Champagne have been partly reclaimed by forest planting. Two hundred thousand acres, planted at a cost of $10 per acre, have now risen in value from $4 to $40 per acre, with a total value of $10,000,000 and a net annual revenue of $2 per acre.

The private forests of France are being freely sold. Speculators buy them, strip them, and sell them for grazing purposes. In this way hilltops and hillsides are being rapidly denuded. This threatens erosion and the silting of farm lands in the valleys by the washing town of infertile soil. The terribly destructive floods of the present year could not have been so violent had the hills of France been kept clothed in forest.

In France, then, forestry has decreased the danger from floods, which threatened to destroy vast areas of fertile farms, and in doing so has added many millions of dollars to the National wealth in new forests. It has removed the danger from sand dunes; and in their place has created a property worth many millions of dollars. Applied to the State forests, which are small in comparison with the National Forests of this country, it causes them to yield each year a net revenue of more than $4,700,000, though the sum spent on each acre for management is over 100 times greater than that spent on the forests of the United States.

France and Germany together have a population of 100,000,000, in round numbers, against our probable 85,000,000, and State forests of 14,500,000 acres against our 160,000,000 acres of National Forests; but France and Germany spend on their forests $11,000,000 a year and get from them in net returns $30,000,000 a year, while the United States spent on the National Forests last year $1,400,000 and secured a net return of less than $130,000.

(To be continued.)

THE DECLARATION OF THE GOVERNORS.

One of the notable features of the Conference on Natural Resources held at Washington in May was the unanimous adoption of a report drawn up to express the views and recommendations of the Conference.

This statement has been called by President Roosevelt "The Declaration of the Governors." Its contents should be carefully read and taken to heart by every American who cares for the future welfare of his country. The Declaration in full is as follows:

"We, the Governors of the states and territories of the United States of America, in conference assembled, do hereby declare the conviction that the great prosperity of our country rests upon the abundant resources of the land chosen by our forefathers for their homes and where they laid the foundation for this great Nation.

"We look upon these resources as a heritage to make use of in establishing and promoting the comfort, prosperity and happiness of the American people, but not to be wasted, deteriorated, or needlessly destroyed.

"We agree that our country's future is involved in this; that the great natural resources supply the material basis upon which our civilization must continue to depend, and upon which the perpetuity of the Nation itself rests.

"We agree, in the light of facts brought to our knowledge and from information received from sources which we cannot doubt, that this material basis is threatened with exhaustion. Even as each succeeding generation, from the birth of the Nation, has performed its part in promoting the progress and development of the Republic, so do we in this generation recognize it as a high duty to perform our part, and this duty, in large degree, lies in the adoption of measures for the conservation of the natural wealth of the country.

"We declare our firm conviction that this conservation of our natural resources is a subject of transcendent importance, which should engage unremittingly the attention of the Nation, the states, and the people in earnest coöperation. These natural resources include the land on which we live, and which yields our food; the living waters which fertilize the soil, supply power, and form great avenues of commerce; the forests which yield the materials for our homes, prevent erosion of the soil, and conserve the navigation and other uses of our streams; and the minerals which form the basis of our industrial life, and supply us with heat, light and power.

"We agree that the land should be so used that erosion and

soil wash should cease, that there should be reclamation of arid and semi-arid regions by means of irrigation; that the waters should be so conserved and used as to promote navigation, to enable the arid regions to be reclaimed by irrigation, and to develop power in the interests of the people; that the forests, which regulate our rivers, support our industries, and promote the fertility and productiveness of the soil, should be preserved and perpetuated; that the minerals found so abundantly beneath the surface should be so used as to prolong their utility; that the beauty, healthfulness, and habitability of our country should be preserved and increased, that the sources of national wealth exist for the benefit of the people, and that the monopoly thereof should not be tolerated.

"We commend the wise forethought of the President in sounding the note of warning as to the waste and exhaustion of the natural resources of the country, and signify our appreciation of his action in calling this Conference to consider the same, and to seek remedies therefor through coöperation of the Nation and the states.

"We agree that this coöperation should find expression in suitable action by the Congress within the limits of the co-extension with the national jurisdiction of the subject, and, complementary thereto, by the legislatures of the several states within the limits of, and co-extensive with, their jurisdiction.

"We declare the conviction that in the use of the natural resources our independent states are interdependent and bound together by ties of mutual benefits, responsibilities and duties.

"We agree in the wisdom of future conferences between the President, members of Congress, the governors of the states on the conservation of our natural resources with the view of continued coöperation and action on the lines suggested. And to this end we advise that from time to time, as in his judgment may seem wise, the President call the governors of the states, members of Congress, and others into conference.

"We agree that further action is advisable to ascertain the present condition of our natural resources, and to promote the conservation of the same. And to that end we recommend the appointment by each state of a commission on the conservation of natural resources, to coöperate with each other and with any similar commission on behalf of the Federal Government.

"We urge the continuation and extension of forest policies adapted to secure the husbanding and removal of our diminishing timber supply, the prevention of soil erosion, the protection of headwaters, and the maintenance of the purity and navigability of our streams. We recognize that the private ownership of forest lands entails responsibilities in the interests of all the people, and we favor the enactment of laws looking to the protection and replacement of privately owned forests.

"We recognize in our waters a most valuable asset of the peo-

ple of the United States, and we recommend the enactment of laws looking to the conservation of water resources for irrigation, water supply, power, and navigation, to the end that navigable and other streams may be fully utilized for every purpose.

"We especially urge on the Federal Congress the immediate adoption of a wise, active, and thorough waterway policy, providing for the prompt improvement of our streams and conservation of their watersheds required for the uses of commerce and the protection of the interests of our people.

"We recommend the enactment of laws looking to the prevention of waste in the mining and extraction of coal, oil, gas and other minerals with a view to their wise conservation for the use of the people, and to the protection of human life in the mines.

"Let us conserve the foundations of our prosperity."

OUR BEST RICE FARMER.

The best rice farmer in the United States—or in the world—is a Japanese living near Webster, Tex. His name is Seito Saibara. Saibara raises an average of 115 bushels to the acre. Saibara began with a 320-acre farm, but now controls about 1,000 acres. He came to this country less than four years ago from Kioto. He has become an American citizen and is bringing up his son to American ways and teaching him that the United States is the greatest country in the world. Seito was a member in Japan of the imperial parliament. While serving in that capacity he met Dr. S. A. Knapp, special demonstration expert of the American agricultural department, who had been sent to Japan to collect some new kinds of rice seed. He became convinced that he would like to come to America, and he sold his possessions and came. He is rated at about $100,000.—*Advertiser.*

FARMERS' BULLETINS.

FARMERS' BULLETIN 320.

Experiment Station Work, XLVI. Compiled from the publications of the Agricultural Experiment Stations. Pp. 32.

CONTENTS: *Fish Fertilizer—Reclamation of salt marshes—Bermuda hay—Protein content of forage crops—Quality in wheat—Potato spraying—Anesthetics in forcing plants—Fattening cattle for market—Cotton-seed meal and corn silage for cows—Carbonated milk—Preservation of fence posts.*

THE GOVERNORS' CONFERENCE.

The following is President Roosevelt's address at the historic conference at the White House called to determine upon a means to check our vanishing national resources:

Governors of the Several States and Gentlemen:—

I welcome you to this Conference at the White House. You come hither at my request so that we may join together to consider the question of the conservation and use of the great fundamental sources of wealth of this Nation. So vital is this question that for the first time in our history the chief executive officers of the states separately, and of the states together forming the Nation, have met to consider it.

With the governors come men from each state, chosen for their special acquaintance with the terms of the problem that is before us. Among them are experts in natural resources and representatives of national organizations concerned in the development and use of these resources; the Senators and Representatives in Congress; the Supreme Court, the Cabinet, and the Inland Waterways Commission have likewise been invited to the Conference, which is therefore national in a peculiar sense.

This Conference on the conservation of natural resources is in effect a meeting of the representatives of all the people of the United States, called to consider the mightiest problem now before the Nation; and the occasion for the meeting lies in the fact that the natural resources of our country are in danger of exhaustion if we permit the old wasteful methods of exploiting them longer to continue.

With the rise of peoples from savagery to civilization, and with the consequent growth in the extent and variety of the needs of the average man, there comes a steadily increasing growth of the amount demanded by this average man from the actual resources of the country. Yet, rather curiously, at the same time, the average man is apt to lose his realization of this dependence upon nature.

Savages, and very primitive peoples generally, concern themselves only with superficial natural resources; with those which they obtain from the actual surface of the ground. As people become a little less primitive, their industries, although in a rude manner, are extended to resources below the surface; then, with what we call civilization and the extension of knowledge, more resources come into use, industries are multiplied, and foresight begins to become a necessary and prominent factor in life. Crops are cultivated; animals are domesticated; and metals are mastered.

Every step of the progress of mankind is marked by the discovery and use of natural resources previously unused. Without such progressive knowledge and utilization of natural resources population could not grow, nor industries multiply, nor the hidden wealth of the earth be developed for the benefit of mankind.

From the beginnings of civilization, on the banks of the Nile and the Euphrates, the industrial progress of the world has gone on slowly, with occasional setbacks, but on the whole steadily, through tens of centuries to the present day. But of late the rapidity of the process has increased at such a rate that more space has been actually covered during the century and a quarter occupied by our national life than during the preceding six thousand years that take us back to the earliest monuments of Egypt, to the earliest cities of the Babylonian plain.

When the founders of this Nation met in Independence Hall, in Philadelphia, the conditions of commerce had not fundamentally changed

from what they were when the Phoenician keels first furrowed the lonely waters of the Mediterranean. The differences were those of degree, not of kind, and they were not in all cases even those of degree. Mining was carried on fundamentally as it had been carried on by the Pharaohs in the countries adjacent to the Red Sea.

In 1776 the wares of the merchants of Boston, of Charleston, like the wares of the merchants of Ninevah and Sidon, if they went by water, were carried by boats propelled by sails or oars; if they went by land, were carried in wagons drawn by beasts of draft or in packs on the backs of beasts of burden. The ships that crossed the high seas were better than the ships that 3,000 years before crossed the Aegean; but they were of the same type, after all—they were wooden ships propelled by sails; and on land the roads were not as good as the roads of the Roman Empire, while the service of the posts was probably inferior.

In Washington's time anthracite coal was known only as a useless black stone; and the great fields of bituminous coal were undiscovered. As steam was unknown, the use of coal for power production was undreamed of. Water was practically the only source of power, save the labor of men and animals; and this power was used only in the most primitive fashion. But a few small iron deposits had been found in this country, and the use of iron by our countrymen was very small. Wood was practically the only fuel, and what lumber was sawed was consumed locally, while the forests were regarded chiefly as obstructions to settlement and civilization.

Such was the degree of progress to which civilized mankind had attained when this Nation began its career. It is almost impossible for us in this day to realize how little our Revolutionary ancestors knew of the great store of natural resources whose discovery and use have been such vital factors in the growth and greatness of this Nation, and how little they required to take from this store in order to satisfy their needs.

Since then our knowledge and use of the resources of the present territory of the United States have increased a hundredfold. Indeed, the growth of this Nation by leaps and bounds makes one of the most striking and important chapters in the history of the world. Its growth has been due to the rapid development, and alas! that it should be said, to the rapid destruction, of our natural resources. Nature has supplied to us in the United States, and still supplies to us, more kinds of resources in a more lavish degree than has ever been the case at any other time or with any other people. Our position in the world has been attained by the extent and thoroughness of the control we have achieved over nature; but we are more, and not less, dependent upon what she furnishes than at any previous time of history since the days of primitive man.

Yet our fathers, though they knew so little of the resources of the country exercised a wise forethought in reference thereto. Washington clearly saw that the perpetuity of the states could only be secured by union, and that the only feasible basis of union was an economic one; in other words, that it must be based upon the development and use of their natural resources. Accordingly, he helped to outline a scheme of commercial development, and by his influence an interstate waterways commission was appointed by Maryland and Virginia.

It met near where we are now meeting, in Alexandria, adjourned to Mount Vernon, and took up the consideration of interstate commerce by the only means then available, that of water. Further conferences were arranged, first at Annapolis and then at Philadelphia. It was in Philadelphia that the representatives of all the states met for what was in its original conception merely a waterways conference; but when they had closed their deliberations the outcome was the Constitution which made the states into a Nation.

The Constitution of the United States thus grew in large part out of the necessity for united action in the wise use of our natural re-

sources. The wise use of all of our natural resources, which are our national resources as well, is the great material question of today. I have asked you to come together now because the enormous consumption of these resources, and the threat of imminent exhaustion of them, due to reckless and wasteful use, once more calls for common effort, common action.

Since the days when the Constitution was adopted, steam and electricity have revolutionized the industrial world. Nowhere has the revolution been so great as in our own country. The discovery and utilization of mineral fuels and alloys have given us the lead over all other nations in the production of steel. The discovery and utilization of coal and iron have given us our railways, and have led to such industrial developments as has never before been seen. The vast wealth of lumber in our forests, the riches of our soils and mines, the discovery of coal and mineral oils, combined with the efficiency of our transportation, have made the conditions of our life unparalleled in comfort and convenience.

The steadily increasing drain on these natural resources has promoted to an extraordinary degree the complexity of our industrial and social life. Moreover, this unexampled development has had a determining effect upon the character and opinions of our people. The demand for efficiency in the great task has given us vigor, effectiveness, decision, and power, and a capacity for achievement which in its own lines has never yet been matched. (Applause.) So great and so rapid has been our material growth that there has been a tendency to lag behind in spiritual and moral growth (laughter and applause); but that is not the subject upon which I speak to you today.

Disregarding for the moment the question of moral purpose, it is safe to say that the prosperity of our people depends directly on the energy and intelligence with which our natural resources are used. It is equally clear that these resources are the final basis of national power and perpetuity. Finally, it is ominously evident that these resources are in the course of rapid exhaustion.

This Nation began with the belief that its landed possessions were illimitable and capable of supporting all the people who might care to make our country their home; but already the limit of unsettled land is in sight, and indeed but little land fitted for agriculture now remains unoccupied save what can be reclaimed by irrigation and drainage. We began with an unapproached heritage of forests; more than half of the timber is gone. We began with coal fields more extensive than those of any other nation, and with iron ores regarded as inexhaustible, and many experts now declare that the end of both coal and iron is in sight.

The mere increase in the consumption of coal during 1907 over 1906 exceeded the total consumption in 1876, the Centennial year. The enormous stores of mineral oil and gas are largely gone. Our natural waterways are not gone, but they have been so injured by neglect, and by the division of responsibility and utter lack of system in dealing with them, that there is less navigation on them now than there was fifty years ago. Finally, we began with soils of unexampled fertility and we have so impoverished them by injudicious use and by failing to check erosion that their crop producing power is diminishing instead of increasing. In a word, we have thoughtlessly, and to a large degree unnecessarily, diminished the resources upon which not only our prosperity but the prosperity of our children must always depend.

We have become great because of the lavish use of our resources, and we have just reason to be proud of our growth. But the time has come to inquire seriously what will happen when our forests are gone, when the coal, the iron, the oil, and the gas are exhausted, when the soils shall have been still further impoverished and washed into the streams, polluting the rivers, denuding the fields, and obstructing navigation. These questions do not relate only to the next century or to the next generation. It is time for us now as a Nation to exercise the

same reasonable foresight in dealing with our great natural resources that would be shown by any prudent man in conserving and wisely using the property which contains the assurance of well being for himself and his children.

The natural resources I have enumerated can be divided into two sharply distinguished classes accordingly as they are or are not capable of renewal. Mines if used must necessarily be exhausted. The minerals do not and cannot renew themselves. Therefore, in dealing with the coal, the oil, the gas, the iron, the metals generally, all that we can do is to try to see that they are wisely used. The exhaustion is certain to come in time.

The second class of resources consists of those which cannot only be used in such manner as to leave them undiminished for our children, but can actually be improved by wise use. The soil, the forests, and the waterways come in this category. In dealing with mineral resources, man is able to improve on nature only by putting the resources to a beneficial use, which in the end exhausts them; but in dealing with the soil and its products man can improve on nature by compelling the resources to renew and even reconstruct themselves in such manner as to serve increasingly beneficial uses—while the living waters can be so controlled as to multiply their benefits.

Neither the primitive man nor the pioneer was aware of any duty to posterity in dealing with the renewable resources. When the American settler felled the forests, he felt that there was plenty of forest left for the sons that came after him. When he exhausted the soil of his farm he felt that his son could go West and take up another. So it was with his immediate successors. When tne soil-wash from the farmer's fields choked the neighboring river he thought only of using the railway rather than boats for moving his produce and supplies.

Now all this has changed. On the average the son of the farmer of today must make his living on his father's farm. There is no difficulty in doing this if the father will exercise wisdom. No wise use of a farm exhausts its fertility. So with the forests. We are over the verge of a timber famine in this country, and it is unpardonable for the Nation or the states to permit any further cutting of our timber save in accordance with a system which will provide that the next generation shall see the timber increased instead of diminished. (Applause.) Moreover, we can add enormous tracts of the most valuable possible agricultural land to the national domain by irrigation in the arid and semi-arid regions and by drainage of great tracts of swamp lands in the humid regions. We can enormously increase our transportation facilities by the canalization of our rivers so as to complete a great system of waterways on the Pacific, Atlantic and Gulf coasts and in the Mississippi Valley, from the Great Plains to the Alleghenies and from the northern lakes to the mouth of the mighty Father of Waters. But all these various cases of our natural resources are so closely connected that they should be coördinated, and should be treated as part of one coherent plan and not in haphazard and piecemeal fashion.

It is largely because of this that I appointed the Waterways Commission last year and that I have sought to perpetuate its work. I wish to take this opportunity to express in heartiest fashion my acknowledgment to all the members of the Commission. At great personal sacrifice of time and effort they have rendered a service to the public for which we cannot be too grateful. Especial credit is due to the initiative, the energy, the devotion to duty and the farsightedness of Gifford Pinchot (great applause), to whom we owe so much of the progress we have already made in handling this matter of the coördination and conservation of natural resources. If it had not been for him this convention neither would or could have been called.

We are coming to recognize as never before the right of the Nation to guard its own future in the essential matter of natural re-

sources. In the past we have admitted the right of the individual to injure the future of the Republic for his own present profit. The time has come for a change. As a people we have the right and the duty, second to none other but the right and duty of obeying the moral law, of requiring and doing justice, to protect ourselves and our children against the wasteful development of our natural resources, whether that waste is caused by the actual destruction of such resources or by making them impossible of development hereafter.

Any right thinking father earnestly desires and strives to leave his son both an untarnished name and a reasonable equipment for the struggle of life. So this Nation as a whole should earnestly desire and strive to leave to the next generation the national honor unstained and the national resources unexhausted. There are signs that both the Nation and the states are waking to a realization of this great truth. On March 10, 1908, the Supreme Court of Maine rendered an exceedingly important judicial decision. This opinion was rendered in response to questions as to the right of the legislature to restrict the cutting of trees on private land for the prevention of drought and floods, the preservation of the natural water supply, and the prevention of the erosion of such lands, and the consequent filling up of rivers, ponds and lakes. The forests and water powers of Maine constitute the larger part of her wealth and form the basis of her industrial life, and the question submitted by the Maine Senate to the Supreme Court and the answer of the Supreme Court alike bear testimony to the wisdom of the people of Maine, and clearly define a policy of conservation of natural resources, the adoption of which is of vital importance, not merely to Maine, but to the whole country. (Applause.)

Such a policy will preserve soil, forests, water power as a heritage for the children and the children's children of the men and women of this generation; for any enactment that provides for the wise utilization of the forests, whether in public or private ownership, and for the conservation of the water sources of the country, must necessarily be legislation that will promote both private and public welfare; for flood prevention, water power development, preservation ot the soil, and improvement of navigable rivers are all promoted by such a policy of forest conservation.

The opinion of the Maine Supreme bench sets forth unequivocally the principle that the property rights of the individual are subordinate to the rights of the community, and especially that the waste of wild timber land derived originally from the State, involving as it would the impoverishment of the state and its people and thereby defeating one great purpose of government, may properly be prevented by state restrictions.

The court says that there are two reasons why the right of the public to control and limit the use of private property is peculiarly applicable to property in land: ''First, such property is not the result of productive labor, but is derived solely from the state itself, the original owner; second, the amount of land being incapable of increase, if the owners of large tracts can waste them at will without state restriction, the state and its people may be helplessly impoverished and one great purpose of government defeated. * * * We do not think the proposed legislation would operate to 'take' private property within the inhibition of the Constitution. While it might restrict the owner of wild and uncultivated lands in his use of them, might delay his taking some of the product, might delay his anticipated profits and even thereby might cause him some loss of profit, it would nevertheless leave him his lands, their product and increase, untouched, and without diminution of title, estate or quantity. He would still have large measure of control and large opportunity to realize values. He might suffer delay but not deprivation. * * * The proposed legislation * * * would be within the legislative power and would not operate as a taking of private property for which compensation must be made.''

The Court of Errors and Appeals of New Jersey has adopted a similar view, which has recently been sustained by the Supreme Court of the United States. In delivering the opinion of the court on April 6, 1908, Mr. Justice Holmes said: "The state, as quasi-sovereign and representative of the interests of the public, has a standing in court to protect the atmosphere, the water, and the forests within its territory, irrespective of the assent or dissent of the private owners of the land most immediately concerned. * * * It appears to us that few public interests are more obvious, indisputable and independent of particular theory than the interest of the public of a state to maintain the rivers that are wholly within it substantially undiminished, except by such drafts upon them as the guardian of the public welfare may permit for the purpose of turning them to a more perfect use. (Applause.) This public interest is omnipresent wherever there is a state, and grows more pressing as population grows. * * * We are of opinion, further, that the constitutional power of the state to insist that its natural advantages shall remain unimpaired by its citizens is not dependent upon any nice estimate of the extent of present use or speculation as to future needs. The legal conception of the necessary is apt to be confined to somewhat rudimentary wants, and there are benefits from a great river that might escape a lawyer's view. (Laughter and applause.) But the state is not required to submit even to an aesthetic analysis. Any analysis may be inadequate. It finds itself in possession of what all admit to be a great public good, and what it has it may keep and give no one a reason for its will."

These decisions reach the root of the idea of conservation of our resources in the interests of the people.

Finally, let us remember that the conservation of our natural resources, though the gravest problem of today, is yet but part of another and greater problem to which this Nation is not yet awake, but to which it will awake in time, and with which it must hereafter grapple if it is to live—the problem of national efficiency, the patriotic duty of insuring the safety and continuance of the Nation. (Applause.) When the people of the United States consciously undertake to raise themselves as citizens, and the Nation and the states in their several spheres, to the highest pitch of excellence in private, state, and national life, and to do this because it is the first of all the duties of true patriotism, then and not till then the future of this Nation, in quality and in time, will be assured. (Great applause.)

FARMERS' BULLETIN 321.

The Use of the Split-log Drag on Earth Roads. By D. Ward King. Pp. 16, figs. 5.

This Bulletin contains directions for the construction and uses of a split-log drag and a ditch cleaner, with statements of the cost per mile of maintaining earth roads in several localities, with these implements.

FARMERS' BULLETIN 323.

Clover Farming on the Sandy Jack-pine Lands of the North. By C. Beaman Smith, Assistant Agriculturist, Bureau of Plant Industry. Pp. 24, fig. 1.

This Bulletin describes the extent and character of the jack-pine lands of the North and contains information in regard to its purchase, cost, etc., with suggestions for its treatment, care of the clover crop, and handling the seed.

WEST MAUI FOREST RESERVE.

PROCLAMATION OF A FOREST RESERVE IN THE DISTRICTS OF LAHAINA, KAANAPALI AND WAILUKU, ISLAND AND COUNTY OF MAUI.

Under and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of Hawaii, as amended by Act 65 of the Session Laws of 1905, and by Act 4 of the Session Laws of 1907, and of every other power me hereunto enabling, I, WALTER F. FREAR, Governor of Hawaii, having held the hearing of which notice has been duly given as in said acts provided, do hereby RECOMMEND AND APPROVE as a Forest Reserve, to be called the "West Maui Forest Reserve," those certain pieces of government and privately owned land in the Districts of Lahaina, Kaanapali and Wailuku, Island of Maui, which may be described in general terms as embracing the entire top of the West Maui Mountain above a line so encircling the mountain as to exclude all agricultural land, and containing an area of 44,440 acres, more or less, in the Districts of Lahaina, Kaanapali and Wailuku, Island and County of Maui, Territory of Hawaii, more particularly described by and on a map made in July, 1907, by the Hawaiian Government Survey Department, which said map is now on file in the said Survey Department, marked "Registered Map Number 1268" and "West Maui Forest Reserve, Maui," and a description accompanying the same, numbered C. S. F. 1854, which said description now on file in the said Survey Department, is as follows:

WEST MAUI FOREST RESERVE,

Including portions of the ahupuaas of Ukumehame, Olowalu, Launiupoko, Puehuehu, Kauaula, Kuia, Panaewa, Paunau, Kuholilea, Puuiki, Halakaa, Wahikuli and Hanakaoo, in the District of Lahaina; portions of the ahupuaas of Honokowai, Mahinahina, Kahana, Mailepai, Alaeloa, Honokahua, Honolua, Honokohau and Kahakuloa, in the District of Kaanapali; and portions of the ahupuaa of Waihee, the ilis of Kou and Hananui, the ahupuaas of Waiehu, Wailuku and Waikapu, in the District of Wailuku,

Island of Maui.
C. S. F. 1854.

Beginning at an iron pipe marking the Government Survey Trig. Station "Paupau" on the Western summit of a conspicuous hill of that name, near the tomb of David Malo and East of the Lahainaluna School, and from which station the true azimuths and distances to the following stations are:

"Launiupoko"	353° 31′ 11.3″	17,396.0 feet
"Puu Laina"	106° 52′ 03″	10,138.8 feet
"Kekaa'	126° 46′ 12″	23,895.1 feet
"Hawea"	167° 48′ 40″	42,845.3 feet,

and thence running by true azimuths:

1. 193° 13′ 00″ 5036.5 feet across Kanaha Valley to the Forest Reserve Monument on Keaalii 2nd;
2. 168° 16′ 50″ 2140.0 feet crossing the land of Kuholilea to Forest Reserve Monument on Keaalii 1st;
3. 178° 12′ 30″ 6351.3 feet crossing the lands of Wahikuli and Hanakaoo to the Forest Reserve Monument on Kailiaa;
4. 182° 50′ 10″ 3297.0 feet across the land of Honokowai to the Forest Reserve Monument on the South side of Honokowai Gulch;
5. 236° 23′ 20″ 2649.3 feet crossing the Honokowai Gulch to the Forest Reserve Monument near the boundary of the land of Mahinahina;

6. 197° 13′ 10″ 8422.9 feet across the lands of Mahinahina, Kahana, Mailepai and Alaeloa to the Forest Reserve Monument on Puu Makani at the head of the land of Honokeana;
7. 291° 01′ 30″ 3823.7 feet across the land of Honokahua to the Forest Reserve Monument on top of Kohaalaau Hill;
8. 161° 42′ 20″ 6096.7 feet to the Forest Reserve Monument on top of Puu Kaeo, the Eastern edge of the coffee farm of 1907 of the Honolua Ranch, being the boundary;
9. 246° 38′ 55″ 12,528.8 feet crossing the lands of Honolua and Honokohau to the Forest Reserve Monument on the West side of Poelua Gulch at Moanui in Kahakuloa;
10. 248° 34′ 20″ 2846.8 feet across the Poelua Gulches and the land of Kahakuloa to the Forest Reserve Monument on Keoa Ridge;
11. 236° 04′ 40″ 2060.7 feet crossing West branch of Honana Gulch to the Forest Reserve Monument on Kapuaikahi Ridge;
12. 328° 29′ 00″ 2486.9 feet crossing the East branch of Honana Gulch to the Forest Reserve Monument at the head of Waikalai flat;
13. 305° 18′ 10″ 3786.4 feet to the Forest Reserve Monument on Maunakini, the highest and most prominent peak on the West side of Kahakuloa Gulch;
14. 325° 01′ 40″ 4857.0 feet across Kahakuloa Gulch, Kaukini Ridge and Kuoa Gulch to the Forest Reserve Monument on Puu Olelo;
15. 318° 16′ 10″ 2592.6 feet crossing Mana Gulch to the Forest Reserve Monument on the mauka West corner of Grant 4982 to J. W. L. Marshall;
16. 329° 53′ 00″ 2510.9 feet along Grant 4982 to J. W. L. Marshall to the Forest Reserve Monument at the South corner of said grant on the West side of Makamakaole Gulch;
17. 313° 18′ 40″ 4348.9 feet crossing the Makamakaole Gulch to the Forest Reserve Monument on Kanoa Ridge on the boundary of Kahakuloa and Waihee just West of the West brink of the Waihee Gulch;
18. 353° 37′ 50″ 10,510.0 feet across the land of Waihee to the Forest Reserve Monument on the boundary of the Ili of Kou in Waiehu;
19. 351° 46′ 00″ 9949.0 feet crossing the ilis of Kou and Hananui and the ahupuaas of Waiehu and Wailuku to the Forest Reserve Monument on ridge at the West side of Iao Valley;
20. 348° 00′ 00″ 8331.0 feet across Iao Valley and the high land back of Wailuku Town to the Forest Reserve Monument on ridge called Kapilau on the boundary between Wailuku and Waikapu;
21. 29° 47′ 10″ 3850.4 feet across the high land of Waikapu to the Forest Reserve Monument on top of Puu Pio, a prominent hill on the North side of Waikapu Valley;
22. 353° 38′ 30″ 15,220.0 feet across the Waikapu Gulch and the high land back of Waikapu to the Forest Reserve Monument on Kaunohua Ridge;
23. 78° 34′ 00″ 3081.0 feet up Kaunohua Ridge to Forest Reserve Monument on the same ridge;
24. 100° 42′ 00″ 1150.6 feet up Kaunohua Ridge to the Forest Reserve Monument on the same ridge at the North side of a gulch just North of the Waikapu-Ukumehame boundary;
25. 101° 05′ 00″ 4667.0 feet crossing above mentioned gulch to the Forest Reserve Monument on top of Puu Anu on the boundary of the land of Ukumehame;
26. 144° 44′ 50″ 3448.5 feet to the Forest Reserve Monument on the West side of the above mentioned gulch, the West edge of the gulch being the boundary;
27. 79° 13′ 00″ 3481.0 feet crossing the high land of Ukumehame to the Forest Reserve Monument on the South edge of Ukumehame Gulch;
28. 36° 07′ 30″ 2234.0 feet along the South edge of Ukumehame Gulch

to the Forest Reserve Monument at the head of Puu Kauoha Ridge;

29. 61° 09′ 45″ 5085.0 feet crossing a gap in the Ukumehame Gulch to the Forest Reserve Monument on top of Puu Kauoha Ridge, the meanders of said ridge being the boundary;
30. 74° 22′ 15″ 2450.6 feet down Puu Kauoha Ridge into Ukumehame Stream and to the Forest Reserve Monument on the North side of said stream just mauka of the Olowalu Plantation dam;
31. 92° 52′ 50″ 1608.5 feet up the North side of Ukumehame Gulch to the Forest Reserve Monument on Puu Kaeo, a rocky spur projecting towards Ukumehame Gulch;
32. 125° 44′ 10″ 5032.7 feet crossing the high lands of Ukumehame and Olowalu to the Forest Reserve Monument on the South side of Olowalu Gulch;
33. 121° 34′ 30″ 6703.7 feet across the Olowalu Gulch to the Forest Reserve Monument on top of a rock knoll in Olowalu;
34. 161° 53′ 00″ 21,361.0 feet across the high lands of Olowalu, Launiupoko, Puehuehu, the Kauaula Valley and the land of Kuia to the initial point.

AREAS.

In Lahaina District.

Ukumehame and Olowalu—Government	7,655	acres
Launiupoko	1,455	"
Puehuehu	440	"
Kauaula	1,455	"
Kuia, Panaewa and Paunau (Lahainaluna School Land)	2,100	"
Paunau	210	"
Kuholilea	120	"
Puuiki—Government	205	"
Halakaa	255	"
Wahikuli—Government	1,550	"
Hanakaoo	720	"
In Kaanapali District.		
Honokowai—Government	1,410	acres
Kahana and Mahinahina	330	"
Mailepai	120	"
Alaeloa	30	"
Honokahua, Honolua and Honokohau	5,720	"
Kahakuloa—Government	5,900	"
In Wailuku District.		
Waihee	4,220	acres
Kou—Government	285	"
Hananui	200	"
Waiehu	1,190	"
Wailuku	4,935	"
Waikapu	3,935	"
Total Area of Forest Reserve	44,440	acres

Excepting from this RESERVE the bottom lands that are now and that may hereafter be used for house lots, agricultural purposes and water development in the valleys of the Government lands of Ukumehame, Olowalu, Paunau (Kanaha Valley), Honokowai and Kahakuloa, and in the valleys of the privately owned lands of Waihee, Wailuku, Waikapu and Kauaula, namely the Waihee, Iao, Waikapu and Kauaula Valleys.

And, as provided by law, subject to the existing leases, I do hereby SET APART as parts of the West Maui Forest Reserve those portions of the government lands known as Ukumehame and Olowalu, Puuiki, Wahikuli, Kuia, Panaewa and Paunau in the District of Lahaina, Hono-

kowai and Kahakuloa in the District of Kaanapali, and Kou in the District of Wailuku, that lie within the metes and bounds of the above described West Maui Forest Reserve.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the Great Seal of the Territory of Hawaii to be affixed.

Done at the Capitol in Honolulu, this 21st day of April, A. D. 1908.

W. F. FREAR,
Governor of Hawaii.

By the Governor,
E. A. MOTT-SMITH,
Secretary.

WAIAHA SPRING FOREST RESERVE.

PROCLAMATION OF A FOREST RESERVE IN THE DISTRICT OF NORTH KONA, ISLAND AND COUNTY OF HAWAII.

Under and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of Hawaii, as amended by of Act 65 of the Session Laws of 1905, and by Act 4 of the Session Laws of 1907, and of every other power me hereunto enabling, I, WALTER F. FREAR, Governor of Hawaii, having held the hearing of which notice has been duly given as in said acts provided, do hereby SET APART as a Forest Reserve, to be called the "Waiaha Spring Forest Reserve" that certain piece of Government land in the District of North Kona, Island of Hawaii, known as the Waiaha Remnant, lying on the Southwestern slope of Mt. Hualalai, bounded on the North by the land of Puaa 1, and on the South by the land of Kahului 2, between the elevations of about 2,300 and 3,000 feet, and containing an area of 193 acres, more or less, in the District of North Kona, Island and County of Hawaii, Territory of Hawaii, more particularly described by and on a map made in December, 1907, by the Hawaiian Government Survey Department, which said map is now on file in the said Survey Department, marked "Registered Map Number 2379" and "Waiaha Spring Forest Reserve," and a description accompanying the same, numbered C. S. F. 1855, which said description now on file in the said Survey Department, is as follows:

WAIAHA SPRING FOREST RESERVE,
Including the Government Remainder of Waiaha 2,
North Kona, Hawaii.
C. S. F. No. 1855.

Beginning at a set stone marked (private mark cannot be duplicated with type) and ahu at the South corner of this tract and on the North line of Kahului 2nd, the true azimuth and distance to Government Survey Trig. Station "Puu Kehoe" being 39° 19′ 1391.0 feet, as shown on Government Survey Registered Map No. 2379, and running by true azimuths:

1. 150° 25′ 710.0 feet along Lot 5 of Waiaha II Subdivision to (private mark cannot be duplicated with type) on set stone and ahu;
2. 175° 36′ 522.0 feet along Waiaha I to (private mark cannot be duplicated with type) on set stone and ahu;
3. 248° 40′ 562.0 feet along Puaa 3rd (Gr. 863 to J. Marechat) to (private mark cannot be duplicated with type) on set stone and ahu;

4. 166° 00′ 347.0 feet along same to (private mark cannot be duplicated with type) set stone and ahu;
5. 75° 00′ 911.0 feet along same to (private mark cannot be duplicated with type) on set stone and ahu;
6. 159° 30′ 927.0 feet along Puaa 2nd (Gr. 926 to Pupule) to (private mark cannot be duplicated with type) on set stone and ahu;
7. 256° 24′ 18″ 1840.0 feet along Puaa 1st (L. C. A. 7715 to L. Kamehameha) to (private mark cannot be duplicated with type) on set stone and ahu;
8. 256° 01′ 27″ 1240.0 feet along same to (private mark cannot be duplicated with type) on set stone and ahu;
9. 281° 11′ 27″ 2886.0 feet along same to (private mark cannot be duplicated with type) on set stone and ahu;
10. 62° 00′ 00″ 5287.0 feet along Kahalui 2nd to the point of beginning.

Area 193.42 Acres.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the Great Seal of the Territory of Hawaii to be affixed.

Done at the Capitol in Honolulu, this 21st day of April, A. D. 1908.

W. F. FREAR,
Governor of Hawaii.

By the Governor,
E. A. MOTT-SMITH,
Secretary.

MAKAWAO FOREST RESERVE.

PROCLAMATION OF A FOREST RESERVE IN THE DISTRICT OF HAMAKUAPOKO, ISLAND AND COUNTY OF MAUI.

Under and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of Hawaii, as amended by Act 65 of the Session Laws of 1905, and by Act 4 of the Session Laws of 1907, and of every other power me hereunto enabling, I, WALTER F. FREAR, Governor of Hawaii, having held the hearing of which notice has been duly given as in said acts provided, do hereby SET APART as a Forest Reserve, to be called the ''Makawao Forest Reserve'' that certain piece of Government land in the District of Hamakuapoko, Island of Maui, known as a part of the land of Makawao or Haleakala Tract, lying on the Northwestern slope of Mt. Haleakala, bounded on the North and East by the Koolau Forest Reserve, on the South by the land of Kalialinui, and on the West and Northwest by the remainder of the land of Makawao, and containing an area of 1,796 acres, more or less, in the District of Hamakuapoko, Island and County of Maui, Territory of Hawaii, more particularly described by and on a map made in May, 1907, by the Hawaiian Government Survey Department, which said map is now on file in the said Survey Department, marked ''Registered Map Number 2394'' and ''Makawao Forest Reserve, Maui,'' and a description accompanying the same, numbered C. S. F. 1792, which said description now on file in the said Survey Department, is as follows:

MAKAWAO FOREST RESERVE,
Portion of Haleakala Tract,
Makawao, Maui.
C. S. F. 1792.

Beginning at a rock + on ''Pali o ka Moa Falls'' on the boundary between this tract and the land of Haiku, the coördinates of said rock

from the Government Survey Trig. Station "Piiholo" being 3773.9 feet South and 7410.0 feet East, as shown on Government Survey Registered Map No. 2394, and running by true azimuths:

1. 325° 55′ 30″ 17,866.5 feet along the land of Haiku to top of Puu Kakae;
2. 97° 37′ 6043.0 feet along the land of Kalialinui to mamane post;
3. 136° 00′ 924.0 feet to mamane post;
4. 114° 40′ 617.0 feet to mamane post;
5. 164° 14′ 2038.0 feet to mamane post;
6. 97° 43′ 2703.0 feet to mamane post at the East edge of the Kahakapao Gulch;
7. 148° 34′ 3125.0 feet to post, the East edge of the Kahakapao Gulch being the boundary;
8. 173° 10′ 3924.0 feet to post, the East edge of the Kahakapao Gulch being the boundary;
9. 202° 19′ 1997.0 feet to post, the East edge of the Kahakapao Gulch being the boundary;
10. 178° 00′ 1301.0 feet to post on edge of gulch above the Puali (neck), the East edge of Kahakapao Gulch being the boundary;
11. 239° 57′ 2079.0 feet to the initial point.

Area 1796 Acres.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the Great Seal of the Territory of Hawaii to be affixed.

Done at the Capitol in Honolulu, this 21st day of April, A. D. 1908.

W. F. FREAR,
Governor of Hawaii.

By the Governor,

E. A. MOTT-SMITH,
Secretary.

FARMERS' BULLETIN 324.

Sweet Potatoes. By W. R. Beattie, Assistant Horticulturist, Bureau of Plant Industry. Pp. 39, figs. 24.

Importance of the sweet potato industry, areas adapted to sweet potato culture, soil requirements, construction of hotbeds, cultivating and harvesting the crop, with directions for the construction of storage houses, grading and packing the potatoes for market, and descriptions of the different varieties.

FARMERS' BULLETIN 325.

Small Farms in the Corn Belt. By J. A. Warren, Scientific Assistant, Bureau of Plant Industry. Pp. 31, figs. 3.

This Bulletin describes a 40-acre farm in Sanders County, a 40-acre farm in Adams County, and a 20-acre farm in Pawnee County, in the State of Nebraska. It contains an account of the methods of crop rotation and cultivation practiced on these farms, with itemized statements of the cost of equipments and production of the crops, with their receipts, for a number of years.

*LINING OF DITCHES AND RESERVOIRS TO PREVENT SEEPAGE LOSSES.**

In a recent bulletin of the California Station E. Mead and B. A. Etcheverry call attention anew to the enormous waste of irrigation water due to seepage from ditches and reservoirs. They show from general observation and from a large number of careful measurements that "the water which sinks into the soil from ditches and reservoirs is one of the chief sources of waste in irrigation. In gravelly soils, or where ditches cross gypsum strata, the losses sometimes amount to more than half the total flow." Measurements made on a large number of ditches in the course of the coöperative irrigation investigations of the Office of Experiment Station and the California Station "show an average loss on main canals of about 1 per cent. for each mile that water is carried; on laterals the loss amounted to between 11 and 12 per cent. per mile; while on some California canals the loss in a single mile was 64 per cent. * * * Measurements made in 1906 on a storage reservoir having a surface of 10,000 square feet showed a seepage loss of 1,000 cubic feet per day. The reservoir is filled by a windmill, and this loss was 10 per cent. of the average quantity pumped each day—a loss too heavy to be borne. The problem of this reservoir owner is the problem of hundreds of irrigators. * * *

"The water which escapes is often worse than wasted. It collects in the lower lands, fills the soil, drowns the roots of trees and plants, brings alkali to the surface, and is a prolific breeding place for mosquitoes."

In the course of the same investigations attempts were made to find practical means of lining storage works and canals and ditches to prevent or at least to reduce this waste and consequent loss. "From the results obtained the conclusion was reached that on large and costly aqueducts or important storage works, linings of cement, concrete, or asphaltum may be employed without the expense being prohibitive." It is pointed out, however, that a very large proportion of the irrigation of the country is done by means of the smaller, cheaper reservoirs and other works, the owners of which "can not afford the expense needed to line the reservoir with concrete or asphalt because the value of the water stored will not justify this expense."

In view of the fact that the greater proportion of the losses occur on lateral ditches and small storage basins, it is necessary to find some simpler and cheaper, but efficient, lining which can be applied by farmers and unskilled laborers. It is clear that the general use of such a method would result in a great improve-

* Compiled from California Station Bulletin 188.

ment of irrigation practice and a marked increase in the duty of water.

Puddling was tried, but as a rule there was not sufficient clay in the soil to make this efficient. A natural silting up, with consequent improvement of water-holding capacity, of reservoirs and ditches carrying muddy water frequently occurs, but a large proportion of the irrigation water used, notably that obtained by pumping, is clear, and therefore no silting results.

Of the large number of available raw materials promising well as ditch and reservoir lining, cement, clay, and crude petroleum were tested as ditch linings in the California experiments. The principal results of the test are given in brief in the following table:

RESULTS OF TESTS OF VARIOUS DITCH LININGS.

Description of lining.	Efficiency ratios.	Saving.	Experimental cost of lining per square foot.	Actual cost of lining per square foot.
		Per cent.	*Cents.*	*Cents.*
Cement concrete, 3 inches thick.......	7.17	86.6	8.30	7.50
Cement-lime concrete, 3 inches thick..	2.90	65.5	8.30	7.50
Cement mortar	2.73	63.3	3.88	3.25-3.50
Heavy oil, 3 2/3 gals, per square yard.	2.02	50.4	1.20	1.20
Clay puddle, 3½ inches thick........	1.78	47.8	3.90	1.20
Heavy oil, 3 gals. per square yard....	1.50	38.0	1.00	1.00
Heavy oil, 2 1/3 gals. per square yard.	1.37	27.3	.77	.77
Thin oil, 2½ gals. per square yard....	1.08	7.3	1.00	.80
Earth (no lining)..................	1.00	0.0	....	....

The table shows wide variations in the efficiency and cost of the different lining materials.

"While there is no doubt that cement concrete is the most efficient as regards seepage, it is also the most expensive, being more than six times the cost of the heavy oil lining (3 2/3 gallons per square yard), which saves 50.4 per cent. of the water which would seep were the ditch not lined. This saving with the concrete ditch is 86.6 per cent., or one and three-fourths times as large. Where water is very valuable there is no doubt but that the concrete is more permanent and economical. But where the water is not so scarce and a little waste will do no damage, the expense of lining the ditch with oil may be justified, while a more expensive lining would be impracticable."

FARMERS' BULLETIN 326.

Building up a Run-Down Cotton Plantation. By D. A. Brodie, Assistant Agriculturist, Bureau of Plant Industry. Pp. 24, figs. 9.

This Bulletin contains an account of three years' work in changing a run-down cotton plantation of 385 acres, in Phillips County, Ark., into a profitable stock and hay farm. It emphasizes the value of leguminous crops, good seed, and good stock.

RAILROADS AND WOOD PRESERVATION.

The recent action by the board of directors of the American Railway Engineering and Maintenance of Way Association in appointing a committee of seventeen to investigate and report upon the subject of wood preservation, has shown that the practical railroad men of the country recognize the importance of taking steps to conserve the rapidly diminishing timber supply of the United States.

Timber is one of the principal materials purchased by the railroads and its economical use is a subject of far-reaching importance. More than 100,000,000 cross ties are used annually by the different railroad companies, and their average life in this country is not more than six or seven years. From a study of European methods, and the knowledge of wood preservation under conditions in this country, timber testing engineers say it is reasonably certain that an average life of from 15 to 20 years may be secured by treating the tie with a good preservative and the use of improved devices for the prevention of mechanical abrasion, thus to a large degree diminishing the drain upon the timber supply.

While the quantity of timber used for ties is very great and the problem of a future supply is a serious one, yet this class of timber is not the only one which should receive consideration. A greater length of service from timber now used by railroads for bridges, trestles, piles, fences and transmission poles is greatly to be desired.

The American Railway Engineering and Maintenance of Way Association now consists of about 900 members, representing 200,000 miles of railroad track and including among its membership the leading railroad engineers of the country. The object of the association is the advancement of knowledge pertaining to the scientific and economical construction, operation and maintenance of railroads. The method employed to obtain this information is through standing committees appointed by a board of directors. Each committee is appointed to investigate a special subject and to report at each annual meeting, presenting the results of its investigation, followed by recommendations which are published in "The Manual of Recommended Practice," after they have been adopted by the association.

FARMERS' BULLETIN 327.

The Conservation of Natural Resources. By Gifford Pinchot, Forester. Pp. 14.

The substance of this bulletin was delivered as an address before the National Geographic Society, in Washington, D. C., January 31, 1908. It tells of the waste of our resources, the danger of monopoly, the problem of future supply, and the necessity for careful handling and wise legislation.

Any Farmers' Bulletin may be obtained free on application to the Secretary of Agriculture, Washington, D. C.

FIELD OF GROWING PINEAPPLES BELONGING TO E. K. ELLSWORTH, MAUNAWAI, PUPUKEA SETTLEMENT.

THE HAWAIIAN

FORESTER & AGRICULTURIST

Vol. V AUGUST, 1908 No. 8

A direct and very tangible outcome of the Conference of the Governors in May, was the appointment by the President on June 8, of the National Conservation Commission. This consists of sections having to do with waters, forests, land and minerals, the members charged with the investigation of waters being those who had previously served on the Inland Waterways Commission. Each section has a chairman and a secretary, who together constitute the Executive Committee, with a chairman who is also chairman of the entire Commission. This important position is held by Mr. Gifford Pinchot.

In accordance with the recommendation of the President, that the several States coöperate with the National Commission in the conservation of natural resources, Governor Frear, on July 22, appointed The Territorial Conservation Commission of Hawaii, a non-salaried board of five members. The personnel of the Commission is as follows: Ralph S. Hosmer, Territorial Superintendent of Forestry, chairman; Hon. W. O. Smith, secretary of the Hawaiian Sugar Planters' Association; Mr. Alonso Gartley, manager of the Hawaiian Electric Company; Mr. Walter F. Dillingham, treasurer of the Oahu Railway & Land Company, and Mr. Jared G. Smith, late director of the Hawaii Agricultural Experiment Station and now manager of the Kona Tobacco Company.

It will be remembered that Messrs. Hosmer, Smith and Gartley accompanied the Governor to the Conference in Washington as delegates from Hawaii. In view of the wide spread public sentiment in favor of forest work and stream conservation in the islands, the work of the Territorial Conservation Commission should prove of lasting importance and productive of tangible results.

For the incorporation in the annual report of the Governor of the Territory for the fiscal year ending June 30, 1907, there were prepared a number of articles on subjects more or less closely related to agriculture. Owing to a new ruling of the Secretary of the Interior, it became necessary to cut down the size of the report and to omit a number of these contribu-

tions. In order that the information contained in them may not be lost, Governor Frear has authorized the publication of them in the "Forester and Agriculturist." The articles will appear in this and successive numbers. It should be remembered that they were prepared for the fiscal year ending June 30, 1907, for which reason certain of the figures quoted may now have been superceded.

The articles are as follows: "The Climate of Hawaii," by E. S. Goodhue, M. D.; "Rubber," by William Williamson; "The Relation of Trade to the Transmission of Disease in the Pacific Arena," by L. E. Cofer, M. D.; "Transportation Facilities of Hawaii," by H. P. Wood; "The Roads of Hawaii," by G. H. Gere.

On July 22 Governor Frear appointed an Advisory Land Law Commission to consider the whole subject of the laws of the Territory in regard to public lands and to report such changes in detail and principles as they shall be satisfied would serve the interests of the Territory. The Governor hopes that if the Commission has recommendations to make they may be in his hands by the end of November so that he can bring them to the attention of Congress with whom lies the power of modifying the existing land laws. The Commission is made up as follows: A. Lewis, Jr., W. A. Kinney, A. W. Carter, Carl S. Smith, S. M. Kanakanui, J. P. Cooke and W. B. Thomas.

DEPARTMENT OF AGRICULTURE PUBLICATIONS.

(See also page 196.)

Classification for American Carriage Horses. By George M. Rommel, Animal Husbandman. Pp. 4. (Circular 113, revised, Bureau of Animal Industry.)

Notes on Dry Farming. By William M. Jardine, Agronomist in Charge of Experiments with Dry-Land Cereals, Grain Investigations. Pp. 6. (Circular 10, Bureau of Plant Industry.)

Farmers' Bulletin Subject Index (Revised to include Bulletin 320). Pp. 31. (Circular 4, Division of Publications.)

FARMERS' BULLETIN, 322.

Milo as a Dry-land Grain Crop. By Carleton R. Ball, Agronomist in Charge of Grain Sorghum Investigations, and Arthur H. Leidigh, Superintendent of the Amorillo Experimental Farm, Grain Investigations, Bureau of Plant Industry. Pp. 23, figs. 9.

This bulletin describes the characteristics of milo, method of cultivation, marketing, insect enemies, and fungous diseases, etc., and emphasizes its suitability as a grain crop for semiarid regions.

THE COLLEGE OF AGRICULTURE AND MECHANIC ARTS.

ARRIVAL OF FACULTY.

Professor John W. Gilmore, the new President of the College of Agriculture and Mechanic Arts of the Territory of Hawaii, comes to his new field of labor with excellent qualifications. President Schurman of Cornell University, and other famous educators, assure the Board of Regents of the College of Hawaii that they have made a splendid selection.

President Gilmore has had a wide experience and a thorough preparation for the work of promoting the new institution. He will arrive about August 24th, accompanied by his family and seven or more professors, selected as members of the faculty, who will immediately take up the work of organizing departments and arranging details for the regular college work that will begin Monday, September 14th. The college, which has been carrying on preparatory work since last February, has its temporary quarters on Young street near Victoria street, expecting to remove to permanent quarters in Manoa Valley later, where it possesses a tract of excellent land of considerable acreage. During the past few months about $25,000 has been spent for equipments and a costly library. With the best talent and material, Hawaii may look forward to the growth of the institution into a college of great credit to both the Territory, and the Federal Government which so freely endows such institutions.

President Gilmore was born in White County, Arkansas, in 1872. He attended the Fort Worth (Texas) High School, and graduated from Cornell University with the class of 1898, receiving the degree of Bachelor of Science of Agriculture. He was appointed instructor in agriculture at the Chinese Government Agricultural School at Wuchang, China, remaining there until the outbreak of the Boxer trouble when he returned to Cornell by Java, India and Europe. On his return to America he was appointed instructor in nature study and agriculture in the Honolulu Normal and Training School, where he remained for one year, leaving then to accept a position in the Government Experiment Station, Island of Negros, Philippine Islands, doing valuable work, particularly along the lines of commercial fibres. In the fall of 1903 he returned to Cornell University, receiving the degree of Master of Science in 1905, at which university the position of assistant in agriculture was tendered him. Last year he was called to the chair of professor in agriculture in the State Agricultural College of Pennsylvania.

Aside from his pleasing personality President Gilmore has the reputation of being an excellent teacher. He now comes to this Territory to lead the educational work of the College of Agriculture and Mechanic Arts.

Hawaii etxends to President Gilmore and his faculty its best wishes and most earnest coöperation in the new undertaking.

THE CLIMATE OF HAWAII.

By E. S. Goodhue, M. D.

[Prepared for the Annual Report of the Governor of Hawaii for 1907.]

Those whose lives have been spent outside of the tropics have a very limited knowledge of the general character of the zone which the geographies term "torrid." Much less do they know of the conditions which prevail in special localities lying in the tropics, and so we see in print for our amusement, if not for our instruction, all sorts of wild ideas concerning our climate and its effects upon the white resident. Knowing next to nothing about the subject, the wise naturalists, physicians and editors of the Far North are yet fascinated by it and fly back to it again and again to singe their wings, not in the tropic zone itself, but in the superheated atmosphere of their fancy. These intelligent and otherwise well-versed observers, though cognizant of the great difference between localities of the same zone and same latitude affected by longitude, altitude and proximity to bodies of water; knowing well that temperate New England and temperate California have little in common, yet persist in taking the climate of low coastal regions in the tropics and hot inland tracts in India, Africa or the Americas as typical of all land lying within the tropics of Cancer and Capricorn.

Heat, always fearful heat. Sultry nights, such as travelers may experience in Florida or the Guiana coast. Dampness like that of the lowlands of Nigeria. "Enervating seasons"—how that phrase is mouthed as a precious morsel—"pestiferous insects," "fearful thunderstorms," "malaria," "final physical and moral degeneration for the white resident."

Then the natives of the tropics are referred to as samples of what the torrid zone produces, and the purveyor of tropical information wipes his brow in the ardor of his over-wrought imagination.

Unfortunately for the countries concerned, temporary residents have gone "home" sick or disgusted, to report unfavorably of their short stop in the tropics. Either they lived in an unhealthy region; by impecuniosity or hereditary equipment were unable to judge of the country as a whole; were mentally disqualified to offer any intelligent opinion of any country, or were unscrupulous and willing to misrepresent in order to arouse wonder in the minds of their far-away hearers.

And again, unfortunately, some very able men have advanced theories regarding the tropical effects of light and temperature which have been applied indiscriminately to all lands within the tropic zone. So far as Hawaii is concerned,

no portion of it comes under the conventional classification. It is certainly never torrid. Though within the district bounded by Cancer and Capricorn, it has a most equable and balmy climate. It has a cool climate. It can offer inducements to the summer climates of the temperate and frigid zones. Tempered by the sea over its entire extent, and cooled over much of its surface by elevation, it has a climate without extremes, year in and year out.

It is an outdoor climate.

Although some of the coastal villages on leeward sides of the islands have a warm climate—in some cases a hot, dry climate—the temperature is not extreme, and under shelter is comfortable for white residents, who often prefer these locations. Such towns are never unhealthy, as is general with coast towns in Mexico or the West Indies. The great cause of sickness in low-lying regions in the tropics is not due to the heat or dampness, but to the presence of mosquitoes and subsequent infection. Malaria is unknown in Hawaii. We have none of the mosquitoes which carry the germ of malaria.

In a section like North and South Kona, covering many miles in extent on the western slope of the Island of Hawaii, we have a climate ranging in temperature from 50 degrees F. minimum to 80 degrees F. maximum. The daily variation is only four or five degrees. It is never cold, but some mornings cool enough to call for the wearing of a wrap. This lasts only a little while and is never unpleasant, as the minimum readings are in Florida, California or Italy.

We have no high winds at all; an occasional "kona wind" blows for a day or so once or twice a year, and then does not return for a year, perhaps. This wind is not cold and may bring rain with it. It blows down a few banana plants or some native trees not firmly fastened in the ground. During the day a gentle breeze blows up the mountain slope from the sea, and at night there is an exchange for a somewhat cooler wind from the mountain.

From November to February there is generally little rain; only a delightful Indian summer, when fruits ripen on the bough. With the summer, rain comes and gives an impetus to plant growth as pronounced as that of spring in the temperate zone. The deciduous trees clothe themselves in abundant green and the usual summer fruits blossom and bear. Rain falls only in the afternoon and night; the morning can be counted on for work or visiting. You may arrange for your lawn party or Fourth of July picnic a year ahead and not be disappointed. Owing to the porous soil there is never any mud or dust. The roads are just as good as any in the United States, ideal roads for automobiling reaching around the island, a distance of 210 miles.

I suffer no inconvenience whatever from exposure to sun on

the hottest day, and have worked on such days in my garden or ridden all day in an open carriage. The newcomer does not go through a mysterious process of acclimatization; he merely discards some of his heavier clothing and adapts himself to an outdoor life. There are absolutely no sultry nights; every night under a blanket. Sunstrokes are never known. Thunderstorms very rare and light. As far as degeneration is concerned, it might be well to look at our children as samples of what the country produces, or the history of the missionary families may be studied with profit. Several of the old missionaries who have spent most of their lives working hard lived to be over eighty, and one now in Honolulu is over one hundred years old.

After a residence of some years in our own house on the side of Mauna Loa, at an elevation of about 900 feet, there is not a single climatic feature I would wish to change, and I think I have been unusually critical and fastidious. It is my business to be.

The forest stretches away in all directions, the sea reaches below and cuts the rugged shore line into bays and inlets, while back of us rises Hualalai, 8000 feet high, cloud-capped most of the time and snow-capped some times. Here the children grow apace. With few of the contagious diseases to threaten their safety, they live out of doors every day, and when indoors are really out, as our sitting and dining rooms are open to the breezes.

With the meats and vegetables of the temperate zone added to the fruits of our own country, one may live abundantly. Torrid is a misnomer for Hawaii, and every day the life we live is an evidence of the incorrectness of most of what is written about "the tropics."

THE MANGOSTEEN FOR PANAMA.

Efforts are being made by the United States Department of Agriculture to introduce the cultivation of the mangosteen (*Garcinia mangostana*) into parts of the Panama Canal Zone, where the climate and soil conditions are suitable.—(Bureau of Plant Industry Report, 1907).—*Agricultural News*, April 18.

ARCTIC BEES.

All bees disappear at 65 degrees latitude, except bumble-bees. So when bees are reported in arctic regions proper they must be bumble-bees.—Dr. v. Buttel, *Bienen-vater*, 50.

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

Division of Entomology.

DIVISION REPORT FOR JUNE, 1908.

Honolulu, Hawaii, July 1, 1908.

To the Honorable Board of
Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen: I have the honor to report herewith upon the work of this Division during the month of June.

VESSELS AND CARGO.

Thirty-one vessels subject to our inspection reached this port. Sixteen of these brought live vegetable matter that we traced in the baggage, freight, and mails. All together we inspected 512 lots comprising 6,641 parcels. The result of the inspection is shown in the following table:

INSPECTION DURING JUNE, 1908.

No. of Lots	No. of Parcels	Disposal
492	6589	Passed as free from pests.
6	33	Fumigated with HCN or CS_2.
10	15	Burned. Mostly because of turnip maggot.
4	4	Thrown overboard. Either fruit prohibited entry because of origin or cherries with leaves and stems, and wormy peaches.
512	6641	Total examined.

FACTS NOTED IN COURSE OF INSPECTION.

Midnight Landing.—U. S. A. Transport Sherman from Manila was detained outside the harbor by the health authorities. She brought a case of live mango trees, and a sack of fresh mango seeds which were landed about midnight. Thanks to the local army authorities these were brought to our attention and received proper treatment. To free them from possible insect and fungus pests the plants were fumigated with the regular dose of Hydrocyanic acid gas, dipped in a standard solution of Bordeaux and

the soil removed from the roots and made innocuous. The husks were removed from the seeds and burned under our direction, as were also the suspicious looking kernels.

Soil.—One of the trying tasks of the Inspector is the removal of soil from about the roots of plants. It cannot be said that the operation is beneficial to the plant, but for the protection of the Territory from injurious, soil-inhabiting insects, like our pernicious "Japanese beetle," we are obliged to remove the soil. Whenever possible we replace it with damp sphagnum moss. Plant importers will save themselves the loss of cherished plants by arranging with their nursery or hot-house firms abroad to remove the soil and wrap the roots in sphagnum moss at the point of shipment.

Coconut From Fanning Island.—The "Marama" on the 23rd brought a consignment of coconuts from Fanning Island. They were old and dry, but owing to the presence of some scale bugs upon them and the suspicion that insects might also be concealed beneath the husk, they were fumigated with both Hydrocyanic acid gas and Carbon bisulfide before delivery to consignee.

Maui and Kauai.—It may interest the Board to know that through the courtesy of the American-Hawaiian Steamship officials we examine here all live vegetable matter aboard their vessels consigned to the other islands via this port.

Acknowledgments.—The Customs and Immigration officers deserve the thanks of this office for the invaluable assistance they render your inspector in calling his attention to live vegetable matter seeking entry through unusual channels. On the 13th we were summoned to the Immigration Station where we found a lot of sweet potatoes brought by an immigrant in his baggage. They were found infested and ordered destroyed save some specimens reserved for breeding in quarantine.

Algaroba Beans For Cuba.—On the 15th we fumigated a lot of Algaroba beans consigned to Prof. J. T. Crawley, formerly of Honolulu, now director of the Cuban Agricultural Experiment Station. The shipment was made by Mr. C. G. Owen, and the fumigation done at his request.

Distributions.—Nineteen colonies of useful insects were distributed during the month.

Mr. Craw.—In closing I will beg your indulgence whilst I pay tribute to the memory of my erstwhile chief. No truer, more devoted, more sincere friend trod this earth while he lived. No nature more gentle, more helpful, more uplifting than was his. No public servant more honest, persevering, painstaking, more devoted to duty. All friendship was his—he died leaving not an enemy in the world. In the death of Alexander Craw every one

that knew him lost a dear, sincere friend, and no one misses him more than his immediate associates in office. During the four years of work under him we have learned to love and revere the very name of Alexander Craw, the name that spelled to us gentleness, sincerity and sympathy in joy and pain. In his death the community has lost a citizen worthy of emulation and a most faithful officer.

Respectfully submitted,

JACOB KOTINSKY,
Assistant Entomologist.

RUBBER.

By W. WILLIAMSON.

[Prepared for the Annual Report of the Governor of Hawaii for 1907.]

The planting of rubber trees for commercial purposes in Hawaii was commenced in 1905 at Nahiku, where climatic conditions seemed particularly favorable for their growth. The planting has mainly been of the Ceara variety, but many Heveas and some Castilloas have been planted and many more of the latter two will be planted during the next few years. The four companies operating at Nahiku are the Nahiku Rubber Company, the Hawaiian-American Rubber Company, the Koolau Rubber Company and the Nahiku Sugar Company.

Planting has also been started in Puna, on the Island of Hawaii, by the Pacific Development Company, and on Maui by the Kaeleku Sugar Company and the Kipahulu Sugar Company.

In 1905, the plantings amounted to 31,650 trees; in 1906, 168,950; and to date in 1907, 177,050, making a total of 377,750 trees. By varieties, the segregation is, Ceara, 369,000; Hevea, 8,150; Castilloa, 600. 445,000 Hevea seeds and stumps and 200,000 Ceara seeds are due to arrive this year, which, together with those to arrive in the spring, should see the total number of trees one year from date close to 1,000,000.

Several hundred Ceara trees are growing in different parts of the Islands, and experimental tappings of these have given such results that the enterprise is looked upon to yield large returns on the money invested.

OSPREY PLUMES.

The wanton destruction of bird life to supply the dictates of vanity and fashion is perhaps no better exemplified than in the commerce of "Osprey" plumes.

Osprey or aigrette plumes of the milliner are the long, loose, waving plumes taken from the backs of different species of small Herons, the white plumaged species, some ten in number, being the most valued. The finest kinds are those from the Little and the Black-footed Egrets. In both species the plumage is pure white, and the long "train" feathers are of a peculiarly loose, flowing type, of great delicacy, and recurved at the tip. It is this latter peculiarity that gives them their special value. Besides the White Herons, several others are laid under contribution. These birds are of varied colors, and the plumes are sold as "red" or "ash" Ospreys, and so on, as the case may be.

Some idea of the havoc annually wrought among these beautiful birds may be gained from the fact that it is computed that the European markets alone dispose of the feathers of nearly half a million birds. When it is known that these natural adornments are only worn by the Egrets during the breeding season, the appalling consequences to bird life may be in some measure computed. Besides the slaughter of the parents, the practice of wearing Osprey plumes, therefore condemns to a slow and lingering death thousands upon thousands of their young. In this way the extinction of "aigrette" producing birds is certain within a comparatively short period.

To many wearers of such ornaments the cruelty of the practice which has supplied them is becoming known and many have decided to abandon the use. Others again are contenting themselves with wearing what are termed "artificial" Osprey plumes in the belief that they are thereby not lending countenance to the destruction of these beautiful birds. It need only be explained that "artificial" Ospreys is only a trade name given to inferior portions of the genuine feather, to show those who are lulling their conscience by such means, that "artificial" Osprey plumes have no real existence, but are in fact as truly responsible for the gradual extermination of our birds as the "real" plumes. The delicate terminal feathers yield the "genuine Osprey" and are sold at a sufficiently high price to pay for the whole plume, leaving the lower portion to be sold at such a price that its cheapness is often quoted as a proof of its artificial nature.

When selling "Ospreys," whenever scruples are manifested by the customer, assurance is given that the plume is artificial. The conscience has to be soothed, and rather than lose a valuable customer the above artifice is resorted to.

Aigrettes in imitation of the "Osprey" are manufactured in a sense by manipulating the feathers of birds other than Herons so

as to produce what is at best a crude resemblance to the "Osprey" plume. Probably the majority of these are made of what are known in the trade as "Vultures'" feathers, which are really the "flight" feathers of the Rhea or South American Ostrich. The method of preparing them is interesting. The shaft is split down the center, so that one-half of the "vane" of the feather adheres to each half of the stem. By spirally twisting this stem the barbs forming the right or left side of the "vane" of the feather are made to form a series of long, slender filaments spirally arranged around a central shaft. The effect produced is really quite different from that of the "Osprey," but the feathers are no more imitation or artificial feathers than are those of the Egret plume. Moreover, the sale of such aigrettes is scarcely less to be deplored than the sale of "Ospreys," since the Rhea is a bird of the utmost scientific interest and importance, and its extinction in a wild state seems to be rapidly approaching. Annually slain by thousands for the sake of its feathers, it has already been extirpated in much of the country it formerly inhabited. It is not farmed for its feathers, as is the true Ostrich.

An equally crude imitation of the real "Osprey" is made by treating Peacocks' feathers in the same may as that just described in the case of the Rhea. The statements that imitation or artificial "Ospreys" are made of split quills, whalebone, or other material, are all *absolutely false.*

In the final summing up by the historian of another age, of the people of today, its utter disregard of the rights of posterity to receive unimpaired the resources of nature, will stand as one of the severest strictures upon present-day civilization.

THE ALFOOS MANGO.

The London *Times* of June 19 last contained a note on the excellent qualities of the East Indian mango known as the 'Alfoos' or 'Alphonso.' This variety is stated to be so popular in Bombay that the fruits command a price of from eight to twelve cents each in the open market. Attempts made to get this mango upon the English market in quantity have so far failed, owing to the decay of the fruit during shipment. During recent years grafts of the Alfoos mango have been imported into Florida, and the fruit growers of that State are reported to have given close attention to its cultivation, since it is recognized that on account of its high quality it would command the best prices. Producers claim that in a short time they will be able to export the fruit in quantity to the London market, and this may be possible, in view of the shorter voyage entailed as compared with that from Bombay.

WHAT FORESTRY HAS DONE.

The following extract is reprinted from Circular 140, Forest Service, U. S. Department of Agriculture.

AUSTRIA AND HUNGARY.

AUSTRIA.

In Austria, which has been independent of the German Federation only since 1866, forestry has, in the main, followed German lines. Austria-Hungary is one of the largest exporters of wood, and the yearly exportations reach 3,670,000 tons. Germany takes more than half of these exports and the rest is distributed to Italy, Russia and Switzerland.

Austria has 24,000,000 acres of forest, of which only 7 per cent. belongs to the State and 58 per cent. is private land. Communal and entailed forests make up the remainder. Of the private forests 34 per cent. is in estates ranging from 20,000 to 350,000 acres in area, and for the last fifty years at least 75 per cent. of the total forest area has been held in large, compact bodies. These large blocks are naturally favorable to forest management. Private forestry is further encouraged by the system of forest taxation, which relieves forests in which forestry is practiced. In the United States there are many enormous private forest holdings on which forestry would unquestionably be practiced were it not that excessive or ill devised forest taxation effectually discourages it.

The total net revenue from the Austrian State forests is over $5,000,000. The net yearly revenue per acre of 21 cents is comparatively low, due mainly to the facts that only 56 cents per acre is expended upon the forest and that most of the area is located in the rugged Alps and Carpathians, where administration and logging are costly.

The present forest department was started in 1872 in response to a popular outcry against the policy of selling State lands. That policy resulted in reducing the area of State forests from 10,000,000 to a little over 7,000,000 acres during the first half of the nineteenth century. The administration was reorganized in 1904, and now has three departments—administration proper, reforestation and the correction of torrents, and forest protection.

Forestry is successfully practiced on 60 per cent. of all the Austrian forests and on 82 per cent. of the private forests, and excellent results have been secured by coöperation between the State and private persons in forest management, particularly under the law of 1883. The most conspicuous fruit of Austrian forestry, however, is the reforesting of the "Karst."

The Karst was a stretch of barren lands in the hilly country of Istria, Trieste, Dalmatia, Montenegro, and neighboring territory along the shores of the Adriatic Sea. It comprised some 600,000 acres. For centuries it had furnished the ship timbers and other wood supplies of Venice, but excessive cutting, together with burning and pasturing, the evil results of clearing, and the natural condition of the land, had left it a waste almost beyond recovery. Many laws had been passed from time to time to stop the forest havoc, but without real effect till 1865. In that year the Government, persuaded by the forestry association, began to offer help to landowners who would undertake forest planting. Taxes were remitted for periods of years, technical advice was given, and plant material as well as money was supplied. Further laws were found necessary in 1882 and 1887 to meet the objections of stockmen. At the present time over 400,000 acres, or two-thirds of the Karst, have been brought under forest, in part by planting, at a cost of from $8 to $10 an acre, in part by protection and the natural recuperation so made possible.

This work has been carried on under the direction of the "forest protective service," which was first created for Tyrol in 1856 as a result of floods in the Tyrolese Alps in 1851 and was later (1871-1874) extended to the rest of the Empire. This service, which is distinct from the State forest administration, has also been especially helpful in encouraging private forestry. Though at first regarded with hostility, it is now held in high regard on the strength of the work it has done and is doing.

Harmony of interest between the State and private forest owners, which the whole Austrian forest policy favors, is notably secured by the encouragement of the wood export trade through such provisions as reduced freight rates, the absence of export duties, and moderate forest taxation.

A "reboisement" or reforestation law, based on that of France, was passed in 1884, to control torrents. This law carries an annual appropriation of $100,000, and the planting work, like that on the lands of the Karst, is carried on under the direction of the "protective service." For the regulation of the lower rivers $1,350,000 was appropriated at the same time, and of this sum $400,000 has been successfully expended on reforestation.

HUNGARY.

Hungary has 23,000,000 acres of forest, of which the State owns 16 per cent.; corporations, 20 per cent.; churches, cloisters, and other institutions, 7.5 per cent.; and private persons the remainder. From $10,000,000 to $12,000,000 worth of wood is annually exported.

About half of all the Hungarian forests are under working plans, by which the cut is regulated so as to provide for a sustained yield, and the present annual cut of 1,000,000,000 cubic feet is believed to be considerably less than the wood actually produced. The State forests yield $600,000 net annual revenue.

The management of all corporation and protection forests has been supervised by the Government since 1879, and all so-called "absolute forest land," in other words, land unfit for farming, must be reforested within six years after it is cleared. Three-fourths of all the forest land of Hungary, including private as well as public forests, falls under the classification of absolute forest land. Moreover, all mountain forests are required to be managed under State working plans. Two-thirds of all the Hungarian forests are brought under this sort of State supervision. Forest planting is encouraged by State nurseries, at which 10,000,000 seedlings are raised every year for free distribution, and by bounties paid for forest plantation established on private waste lands.

Hungary has some 600 square miles of shifting sands and waste lands, like those of the Landes of France. The work of reclaiming these was planned by the law of 1788. Actual planting was begun in 1817. By 1869, 20,000 acres had been forested, and parts of the plantations were beginning to yield a profit. The work of reforesting is constantly going on.

NORWAY, SWEDEN AND DENMARK.

NORWAY.

Only 21 per cent., or 20,000,000 acres, of Norway is in forest. The State owns less than 2,000,000 acres of this. Of the forest region one-half has to import timber, one-fourth has sufficient for its needs, and one-fourth is able to export over 1,000,000 tons, valued at $18,000,000 a year. Nearly two-thirds of the exports go to England and most of the rest is divided up between Belgium, Australia, France, Holland, Germany, and Denmark. The total annual cut, one-fifth of which is exported, is about 500,000,000 cubic feet. It exceeds by 1,500,000 cubic feet the amount of wood grown by all the forest in the same time. In other words, the cut is far too heavy to last, so that a reduction of wood exports is inevitable.

Forestry is on a low level. The various provisions for the better use and protection of the forests, which began three hundred years ago, have been of too half-hearted a nature to meet the situation. There is a forest service, but the officers are few and underpaid, and the districts under their care—sometimes several million acres to each—are far too large for effective work. Moreover, there are difficulties over the forest

rights which were earlier granted to encourage the development of the country, but which are now greatly in the way of establishing property rights and organizing an administration.

Since 1860 the State has been buying cut-over lands in order to plant them to forest where forest protection is needed, and from $15,000 to $20,000 a year has been spent in this way during recent years.

The communal forests are supervised by the government, and are usually managed by the foresters with a view simply to supplying local needs. Sales outside the parishes are permitted only where there is more than enough for these needs.

SWEDEN.

Sweden has nearly 50,000,000 acres of forest, covering nearly 50 per cent. of the total land area. Since the English import duties were abolished in 1866 the wood exports from Sweden have steadily increased, till now Sweden stands next to Russia, the world leader, in wood exports, with $54,000,000 worth a year, representing nearly 4,500,000 tons. England takes half of this, followed by France, Denmark, Germany, Holland, Cape Colony, Australia, and South America. The total cut from the forest is estimated to be near 1,000 million cubic feet.

The State owns about 13,500,000 acres, or 33.2 per cent., and controls 4,000,000 acres more. The State lands are, in the main, of lesser commercial value, and this fact, together with the existence of logging rights granted in the past, keeps the net income for the present down to 12 cents an acre. Nevertheless, since 1880 the net revenue from the State forests has risen from $300,000 to nearly $2,000,000 a year.

Up to five hundred years ago Sweden was overburdened by forests, but by that time cutting and wasting had gone so far that the willful setting of forest fires was forbidden. In 1638 overseers of communal forests were appointed in order to conserve supplies of wood for charcoal used in the iron industry. A general law followed in 1647, and a director of forests in the two southern districts was appointed in 1720. All through the eighteenth century, restrictions upon forest use were in force. Toward the close of the century there was, indeed, a premature scare over a possible timber famine. Yet, despite this legislation, and much legislation which followed, waste continued to go on. While measures were being passed to conserve the forests, the communal forests and town forests were actually being sold. It was not till the law of 1903, which went into effect in January, 1905, that a satisfactory policy was secured. In general, this requires the practice of forestry. As in Russia, provincial forest protection committees have to approve the local felling plans. A diameter limit is set, below which trees may not be cut. Clearings are for-

bidden and cleared land, unless used for other purposes, must be reforested. Pasturing is restricted where it would do harm.

In the past thirty-five years the State has increased its forest holdings by 45 per cent. through the purchase and reforesting of wastes and sand dunes and by the settlement of disputed titles. The purchases amount to over 600,000 acres, for which an average price of $5.30 an acre was paid.

Lumbering is carried on much as it is in the United States. The State, as a rule, sells stumpage, and the timber is removed by contractors. Management is by no means so detailed and intensive as in Germany or France. The trees which are to be cut are marked, but no attempt is ordinarily made to prepare complete working plans. Only a moderate amount of planting is done to secure the future crop, and natural reproduction is mainly relied upon.

Forest fires continue to do great damage, especially in the northern part of the country. A forest patrol is doing effective work, however, in checking the spread of fires.

DENMARK.

Denmark has about 600,000 acres under forest, of which the State owns over 23 per cent., or 142,000 acres. About 75,000 acres of wastes are in process of reforestation.

The need of wiser forest use was felt in the eighteenth century, and by 1781 the State forests were placed under administration. But the clearing of the forest continued at such a rate that in 1805 it was provided that the still existing forests of beech and oak should be maintained forever. Further, provision was made as to the selling of the peasants' farms, so that they should not be accumulated in large holdings upon which the peasants would have to depend for their wood.

Since 1820 the forest area has been increasing. At present reforesting is adding to it very considerably. Nearly 200,000 acres of heath have been planted in the last forty years. To this work of reclamation the State contributes $40,000 a year.

In State forests, as well as in the communal forests and the farmers' woodlots, forestry is carefully and profitably practiced.

(To be continued.)

BANANAS IN COSTA RICA.

The United Fruit Co. of Boston has upwards of 150,000 acres planted in bananas in Costa Rica. To handle the produce of these immense fields more than 400 steamers laden with the fruit left Port Limon in 1906. Costa Rica is now the foremost banana-growing country in the world.

THE WATER RESOURCES OF MOLOKAI.

Under the above title Waldemar Lindgren offers a valuable illustrated contribution to economic literature of the Hawaiian Islands.

After a general introduction devoted to the topography of the island an interesting description of the geology follows:

Like the other islands of the Hawaiian group, Molokai is almost entirely of igneous origin. It is a volcanic cone built up in the middle of the ocean by a great number of superimposed basaltic flows. The island is, in fact, like Maui, formed by two volcanoes, and these two cones are separated by a low gap on which secular disintegration has reduced the basalt to a deep red soil. The west end forms one, separate and complete, though comparatively low cone. Partly obliterated craters are still visible near the summit, between Mauna Loa, Kaana, and Amikopala. The cone is not very regular, and secondary centers of eruption were probably located near the southwest and northwest corners of the island. The steep pali running north from Mauna Loa to the coast indicates a dislocation along which the east side has dropped a few hundred feet.

The main or eastern part of the island is not of so simple a structure. It represents one part, and probably the smaller part, of a large volcano, the northern part having dropped down along a great break or dislocation to a depth of from a few hundred to 3,000 or even 4,000 feet. Thus, the great northern pali is really an immense break or a fault line, which split the volcano in two. The slopes of the lava flows are everywhere to the south from 4° to 13°, even in the cliffs of the north coast the same inclination is observed. This, in conjunction with the form of the island, shows that a part of the volcano has been removed. Neither wave action nor erosion by running water could possibly have produced such an escarpment as that of the great pali, reaching 3,000 feet in height. The work of erosion on this cliff is shown plainly enough in the great alcoves cut by the water courses. This erosion is still cutting southward and the divide is no doubt steadily migrating in that direction.

A coral reef from one-half to one mile fringes practically the whole southern coast of the island. The parts adjacent to the main gulches are gradually being filled up by mud. Thus, the island is gradually growing out in this direction. Seen from a high point, the reddish mud flats skirting the shore contrast strongly against the brilliant emerald green of the reef; and beyond this is the dark violet-blue color of the deep sea. Small amounts of coral rock, indicating a former higher water level, are

found all along the southern coast; usually these only reach 25 feet above water level, though in one place a coral reef is found 130 feet above sea level.

In regard to temperature, the island possesses the same equable climate as that enjoyed by the others of the same group; frost probably never occurs, even at the highest elevations. The trade winds are strong, especially during the winter months and on the northern coast. During long periods it is impossible to effect a landing at the settlements of Wailua and Pelekunu. Even along the south coast the winds are usually strong in the afternoon, and over the bare west end, or Kalaukoi, and over the gap the breezes sweep without hindrance. There is in general a wet season, extending from October until the end of May, and a dry season including the summer months. On the whole, the west end, the gap, and the south shore as far as Kamalo are included in the arid zone of the island, while the whole northeasterly part may be counted as one of abundant precipitation. Accurate data regarding rainfall extending over any considerable period are not obtainable.

Regarding the quality of rainfall in the mountains there is scant information. The annual precipitation probably reaches 100 inches at elevations of 3,000 and 4,000 feet and is not far from this amount over considerable area on the north slope on the headwaters of Waikolu, Pelekunu and Wailau.

It has been asserted that the rainfall on Molokai is decreasing. A's far as the data go there is nothing to prove such an assertion. It is no doubt true that the island formerly supported a much denser population; this is indicated, for instance, by many old garden patches at streams which are now dry or carry water only intermittently. All this is, however, most probably directly chargeable to the destruction of the forests and the following irregularity or disappearance of the water supply.

The soils of Molokai are similar to those of the other islands of the Hawaiian group and are usually of great fertility. They may be divided into residual and sedimentary soils.

The residual soils result from the gradual decomposition of the basaltic lavas and are usually deep red, very rich in iron and in substances necessary for plant growth.

The sedimentary soils are partly of a deep-red color, partly dark brown, and not very different in character from the residual soils; they consist, in fact, of the same substance merely transported and redeposited. In a few places along the immediate coast line are small areas covered by coral sand, consisting largely of carbonate of lime, usually more or less mixed with detritus from the hills.

The west end of the island contains a very great amount of good, smooth land, with excellent soil. In fact, the larger part of Kaluakoi is of this character, excepting the southern slope of the long ridge extending from Mauna Loa to the lighthouse, the

extreme northern and western portion, and the steep slope extending from Mauna Loa northward to the sea. The soil is residual in character. Unfortunately there is no feasible way of bringing water on this part of the island. It is at present used for sheep ranches and cattle range, being covered by a fine growth of nutritious grasses.

The finest body of agricultural land on the island is situated in the great gap, and has an area of about 14,000 acres. The principal problem of the water supply of the island is how to bring the water from that part which receives an abundant precipitation to this arid portion containing the rich soils. This area of gently rolling hills is covered by a deep-red soil unexcelled for purposes of sugar growing. To a great extent it is a sediment soil, as shown, for instance, along the western plantation fence near Mauna Loa Creek, where it follows the cane planted January, 1900. At this place a depth of from 20 to 30 feet of fine soil and disintegrated washed gravels is observed, resting on basaltic lava. This formation no doubt underlies a large portion of the cane lands. A part, however, of the eastern area on the rising hills is covered by residual soil derived from rock in place.

In regard to vegetation, the southern side of the island may be separated in several zones. There is first the immediate coast fringe, distinguished by coco palms and algarobas; the barren zone; the belt of the grass lands, and finally the high forests.

The southern coast is fringed by a narrow, bright-green zone of thick and luxuriant algaroba trees which furnish excellent firewood. The abundant bean pods of the tree are used as forage for cattle and horses. This strip is only a few hundred feet wide, but extends from Kawela Creek, almost without interruption, to a point a few miles west of Palaau.

The barren zone of rough lava bowlders, with only a few bushes adapted to a dry climate, extends along the south coast, from the western point of the island to beyond Kamalo on the east. At Palaau it reaches an altitude of 200 feet; at Kaunakakai, 1,000 feet; and at Kawela, 2,000 feet. Toward Mapulehu the grasses reach sea level.

The pasture lands are covered by a thick carpet of manienie (a variety of Bermuda grass) or delicate tufted Pele grass. Above a certain elevation (about 500 feet on the west end) these give way to annual grasses. Almost the whole of Kaluakoi, or the west end, is covered by pasture land; likewise the gap, excepting the arid strip near Palaau. Both of these areas are practically treeless. During the arid season the grass dries up. In the creeks and canyons east of the gap are found groups of kukui trees, with their smooth trunks and yellowish-green foliage bright with an almost silvery sheen.

As the elevations increase the grassy ground becomes more swampy. It should be observed that all forests on the island grow on swampy ground. Open forests with trees growing on

dry ground do not exist. Speaking generally the trees are in poor condition and on large areas are dying.

Many theories have been advanced as explanations of the decay of the forest. It has been attributed to cattle, deer and goats, to decrease of rainfall, and to a disease of the trees.

It is evidently true that for many years the island has been overstocked, especially the good pastures at higher elevations, and it can easily be understood how the damage to the trees is effected. The cattle do not kill the trees directly, but they destroy the thick growth of ferns and grass which protects the roots and which is evidently essential to the life of the lehua tree. They also eat the young trees just coming up from seed. This has assuredly been the most prominent cause. But in many canyons where cattle scarcely can find their way, as well as in some parts of the swamps near the Pelekunu pali, the lehua trees are also dying, which indicates that the tree is besides suffering from some insect or fungus. The deer do less harm than the cattle, but it may nevertheless be well to keep their number within reasonable limits. In lower elevations goats abound, which should be removed as thoroughly as possible, for they completely destroy the already scant vegetation. Sheep have lately been confined to the western end (Kaluakoi), which seems most suited to them.

All in all it seems that the cattle, in part aided by the disease referred to, are responsible for the decay of the forests and that it is not necessary to assume any material change in climate. As mentioned, there is no such decay noticeable at Mapulehu, where very few cattle have been pastured. In consequence of the drying up of the swamps, the rainfall runs off rapidly and the streams become more intermittent and torrential in character, as indeed is very clearly marked in the case of Kawela. To remedy these conditions, the exclusion of cattle and other fern-destroying animals from the upper mountain region is suggested, which may cause the swamp ferns and lehuas to grow up again. Planting certain areas of land below the swamps by eucalyptus, acacia or Monterey cypress would remedy matters to some extent.

The writer divides the available water resources of Molokai under springs, streams and wells. The springs are divided into three classe: First, those emerging at sea level; second, those appearing at elevations from 1,000 to 2,500 feet, and third, those of the summit region feeding the permanent streams.

The first are very numerous, and often, by reason of their vicinity to the shore, more salty than the normal ground water. A detailed account is then given of the permanent springs of the island, together with their approximate flow and degree of salinity. The largest springs noted appear in the ricefield east of Kawela Gulch, which have a daily discharge of 450,000 gallons and contain 12 grains of salt per gallon.

The running streams of Molokai are also treated in detail with

a view to determining their permanence, volume and utility, and finally the wells are analyzed for a like purpose.

The theoretical amount of water available is discussed at length from the annual rainfall. The precipitation is disposed of in three ways: First, a relatively small part is lost in evaporation; secondly, a large part is absorbed by the soil, and continually moving, sinks down to the surface of permanent saturation (all of this water finding its way eventually to the shore and emerging at or about sea level), and thirdly, a part runs off in living streams.

The utilization of the water supply of Molokai is now dealt with and the problems involved in increasing the water for irrigation purposes is discussed in a practical manner. The question of reservoirs, tunnels, pumps and flumes is also discussed and many valuable suggestions are advanced for conserving the water supply for economic purposes, including its use for the development of electrical power.

Altogether the article referred to is a most interesting one, and contains much thoughtful matter which is particularly valuable to those conversant with island conditions. Admirable illustrations add to the utility of the work. It is to be regretted, however, that the established usage of Hawaiian and other orthograph has not been adhered to, for the renderings 'manania' for manienie, 'eea' for ieie and 'lantania' for lantana come as somewhat of a shock to the kamaaina.

The Water Resources of Molokai, Hawaiian Islands, by Waldemar Lindgren, forms Water-Supply and Irrigation Paper No. 77, Series O, Underground Waters 19 of the publication of the U. S. Geological Survey, Washington.

PRICKLY PEAR A MOSQUITO PREVENTIVE.

The most important practical discovery in dealing with the mosquito nuisance since the action of kerosene was understood has been made by a French physician, M. Sanzeau de Puyberneau, who has found that the leaves of the common prickly pear if chopped up and thrown into water will prevent mosquitoes breeding in the water for weeks if not months. The resinous mucilage of the leaves floats on the water surface and chokes the breathing tubes of the mosquito. Further, in stagnant fœtid water the prickly pear juice has the property of absorbing the gases of decomposition. It is most important that as extensive a trial as possible may be made of this new method of mosquito prevention in the Zanzibar Islands. The prickly pear is everywhere, and very little trouble is needed to chop up the leaves and drop the pieces into water, which formerly had to be repeatedly kerosined. —*Zanzibar Gazette,* April 29.

UNITED STATES DEPARTMENT OF AGRICULTURE, DIVISION OF PUBLICATIONS.

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BULLETINS—NEW.

Varieties of Cheese: Descriptions and Analyses. By C. F. Doane, Assistant Dairyman, Dairy Division, and H. W. Lawson, Office of Experiment Stations. Pp. 72. (Bulletin 105, Bureau of Animal Industry.) Price, 10 cents.

Miscellaneous Papers on Apiculture. Bee Diseases in Massachusetts. By Burton N. Gates, Expert in Apiculture. Pp. 10, map. (Bulletin 75, Part III, Bureau of Entomology.) Price, 5 cents.

A Revision of the Ixodoidea, or Ticks, of the United States. By Nathan Banks, Assistant Entomologist. Pp. 61, pls. 10. (Bulletin 15, Technical Series, Bureau of Entomology.) Price, 15 cents.

Hawaiian Honeys. By D. L. Van Dine, Entomologist, and Alice R. Thompson, Assistant Chemist, Hawaii Agricultural Experiment Station. Pp. 21, pl. 1. (Bulletin 17, Hawaii Agricultural Experiment Station.) Price, 5 cents.

Experiment Station Record, Vol. XIX, No. 9, May, 1908. E. W. Allen, Ph. D., Editor. Pp. viii, 801-900. (No single copies of Vol. XIX sold.)

The Record contains numerous abstracts of the publications of the agricultural experiment stations and kindred institutions in this and other countries; articles and editorials on topics of special interest in agricultural science by American and foreign experts; and notes on the experiment stations.

NOTE.—*For the convenience of those who desire to receive this publication regularly the Superintendent of Documents has decided to fix the price per volume (12 numbers), beginning with Volume XIX, at $1.50 per volume, payable in advance.*

THE HAWAIIAN

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THE RELATION OF TRADE TO THE TRANSMISSION OF DISEASE IN THE PACIFIC ARENA.

BY L. E. COFER,

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[Prepared for the Annual Report of the Governor of Hawaii for 1906.]

The Pacific Arena comprises the Pacific Ocean and its continental and insular boundaries. These boundaries are Siberia and Alaska to the North, New Zealand to the South, North and South America to the East, and Asia and Australia to the West.

The Pacific Arena, in a commercial sense, comprises every continental port bordering upon or tributary to the Pacific Ocean, including the ports of Polynesia and Micronesia.

The Pacific Arena in a maritime quarantine sense only includes the principal sea ports which bound the Pacific Ocean, or the insular ports which lie within its confines.

The Quarantine Arena of the Pacific specifically described comprises the Pacific Ocean, with the port of Honolulu occupying practically a central position therein and the following ports forming its far distant boundaries, namely: Victoria, Vancouver, Port Townsend, Portland, San Francisco, Port Los Angeles, San Diego, Mazatlan, Acapulco, Salina Cruz, Panama, Guayaquil, Callao, Iquique, Antofagosta, Valparaiso, Wellington, Auckland, Sydney, Brisbane, Singapore, Manila, Hongkong, Shanghai, Nagasaki, Kobe and Yokohama.

Commercially speaking, the ports mentioned are either centers of export or import or else are simply ports of call.

Hygienically speaking, they are or may at any time become either disease centers of export or import or both.

They are important from a quarantine standpoint both on account of the steady increase of intercourse between these ports

and on account of the fact that for their respective countries they are points of centralization and distribution.

As infected places their relative importance is subject to wide variation, but as infectible areas they are equally important from a general quarantine standpoint.

Hawaii, particularly its principal port, Honolulu, is from its geographical location the natural strategic point in this vast arena.

The judicious use of Honolulu as a port of call will greatly modify, if not absolutely eliminate, the danger of any one of the above named ports from a quarantine standpoint.

The trade between the Pacific coast of the United States and the Hawaiian Islands, Japan and China will always have the same relative bearing upon the quarantine status of the Pacific Arena that it has at present. That is to say, while the opening of the isthmian canal will greatly increase the commerce in the Pacific Arena, the old and established route just mentioned, although its trade will probably be proportionately increased, will show no relative difference in the amount of quarantinable disease transmitted. That the increase in the trade in the Pacific Arena and especially the changes in the trade routes will influence if not reorganize quarantine procedure, is a fact which seems absolute.

In the report of the Isthmian Canal Commission it is predicted that for each decade up to the opening of the canal, commerce in the Pacific Ocean will increase 25%. It is also predicted that by the year 1924, traffic will be further increased by 62½% of what it is at present. But it is not the increase in the traffic which interests the student of quarantine so much as the new trade connections which will be formed between disease centers hitherto widely separated. The present trade route between the Pacific Coast ports and China and its bearing upon the transmission of quarantinable diseases is fairly well understood at the present time and an increase in volume of that traffic can be easily met by a relative increase in administrative equipment. But a prospective increase of trade involving new routes, new climates, and new diseases naturally opens up a new problem in the quarantine work in the Pacific Arena.

In considering the present and prospective trade in the Pacific Arena and its probable bearing upon the general public health, mention of the principal ports and the character of the trade carried on in them will be necessary.

The ports in the Pacific Arena may be divided into North American, Central American, Isthmian, South American, Australasian, Philippine Island, Pacific Island, Chinese and Japanese. The North American ports are the shipping points for food products, iron and steel manufactured supplies, the basic materials of industry and general merchandise. The Central and South American ports are the shipping points for wool, nitrate of soda,

sugar, ores and cacao. Through the Australasian ports are shipped wool, coal, food supplies and raw materials. The Philippine Islands export hemp, copra, sugar and tobacco.

Through the Japanese ports are shipped raw silk, straw mattings, rugs, tea, notions, rattan, cane, bamboo and coal.

From the Chinese ports come raw and manufactured silk, tea, hemp, opium, hides, bristles, wool, wax and curios.

The Pacific Islands, particularly those of the Hawaiian group, export sugar almost exclusively. The Philippine Islands have not sufficient trade at present to make it profitable for many vessels out-bound for Hongkong, Shanghai and Japanese ports to make a detour to Manila.

Moreover, there are at present no wharf accommodations for large vessels in Manila and nearly all the traffic must be handled by lighters. Without doubt all of these obstacles to great commerce will be removed in the future and with the development of wharves and the abolishment of lighters, Manila will become a very vulnerable disease center. After the Panama Canal is opened it is predicted that the Puget Sound ports will become important centers for the distribution of Japanese and Chinese goods. The reason of this lies in the fact that the great circle route between the American isthmus and the Orient runs close to the coast of the United States and with the exception of those vessels that desire to call at the Hawaiian Islands, this route will be the one naturally taken by vessels to and from the Orient. This great circle route will also have the advantage of enabling steamers to coal on the west coast of the United States or at Vancouver. In addition to being near an ocean highway, along which a large quantity of imports will travel, the Puget Sound ports will be able to supply steamers with coal. Thus will communication between the yellow fever ports on one side and the plague and cholera ports on the other be probably modified by passage through the Puget Sound quarantine stations, just as the danger of the present Trans-Pacific traffic is modified by the quarantine work at Honolulu.

Another disease route to which the opening of the Panama Canal will give rise will be that between Chili and the Southern States of America. The South will buy nitrate of soda from Chili and with their great stores of phosphate rock sell a manufactured fertilizer to all of the countries in the Pacific Arena. This trade will form one of the connections, through the Panama Canal, between the yellow fever and malaria zones of the Southern part of the United States and the plague ports of South America, Australasia and the Orient. Again the Gulf ports will export cotton, cotton goods, lumber, and manufactured iron and steel in exchange for the tea, silk, mattings, curios and other manufactured articles of the Orient. The result of this intercourse may be the exchange of malaria and yellow fever on the part of the Gulf ports for the plague and cholera of the Orient.

The North Atlantic ports from which the major part of the general manufactures will be sent will also be exposed to such disease exchange.

It is predicted that after the isthmian canal is completed, a large part of the world's commerce will be done by tramp steamers.

It is probable that nowhere will the use of tramp steamers be found more profitable than in the Pacific Arena.

Such steamers will carry coal from Australian and Japanese ports to every other port in the Pacific Arena. If the mines of China are ever developed, coal may be shipped by tramp steamers from Chinese ports to all parts of the Pacific Arena. This prospective intercourse between Chinese and other Pacific Arena ports by means of tramp steamers will tend to increase to a marked degree the chances of the interchange of the quarantinable diseases, as the tramp steamer as a rule is more likely to become infected than either passenger steamers or sailing vessels.

It is claimed that Japan's industrial revolution has only begun, and that she will require more and more of the products of the United States. As the South Carolina phosphates, iron and steel fixtures, raw cotton, leather goods and flour will probably come through the Panama Canal, and the raw silk from Japan go back by the same route, the danger of the interchange of quarantinable diseases between the Southern States and Japan will be still further increased. Although Japan is very efficient and progressive both in her internal sanitation and quarantine, her steady imports from China of rice, cotton, beans and peas will be a constant source of danger from infection with quaratinable disease. All signs point to the trade interchange between the United States and South America becoming from a quarantine standpoint somewhat similar to that between the United States and China. The reason for this lies in the fact that Chili will buy from all parts of the world, and on account of her return cargoes of nitrates, ores and heavy produce will probably become infected with all of the quarantine diseases.

The ports of North America, Vancouver, Seattle and San Francisco are known from a quarantine standpoint as "tourist and immigration ports."

Doutbless after the isthmian canal is completed Port Townsend, Portland, Los Angeles and San Diego will be similarly designated. These "tourist and immigration ports" are the eastern termini of the principal passenger and freight lines which ply between the Occident and the Orient. A large number of tourists pass through these ports every year, en route to or from the Orient or Australasia.

The tourist is an important factor in quarantine work in the Pacific Arena, because such a person is invariably bound for or returning from the principal disease centers, and his object, the observation of foreign places, people and customs, and the purchase of articles of interest, entails an unusual and marked con-

tact with an environment which usually presents a high ratio of infection.

Owing to the steadily increasing tourist traffic in the Pacific Arena, the large modern ocean-carrier is coming more and more into use between the "tourist ports" and the Orient. These great steamers bring large numbers of immigrants from the Orient, and also the bulk of the Oriental freight.

Therefore the "tourist ports" are important in a quarantine sense on account of the hazard caused by the periodical arrival of the large ocean carriers bringing tourists, immigrants ,and freight direct from the Oriental disease centers.

The North American ports, on the other hand, are as a rule remarkably free from infection with the quarantinable diseases, and one might be led to regard them as unimportant from a quarantine standpoint but for the fact that they are the trans-shipping points for the whole continent of North America, from the furthest limit of which transportation can be effected in five or six days by rail.

This fact makes it possible for a person having been exposed in New York City to the infection of smallpox, a disease having an incubation period of from twelve to fourteen days, to reach Honolulu before the disease manifests itself.

The Asiatic ports are naturally the most important points from which to expect infection from all of the quarantinable diseases save yellow fever. The Philippine Island ports on account of the rigid out-going quarantine operated from these points by the Public Health and Marine Hospital Service has never given special concern.

The Japanese ports, despite the high order of quarantine and internal sanitation practiced in those places are dangerous on the whole, both by reason of their close proximity to China, and by the heavy traffic always existing between Japan and China on the one hand and Japan and the United States on the other. The Australasian ports, particularly Sydney, Melbourne and Auckland, at least as far as plague is concerned, are practically in the same class with those of Japan. The South American ports are danger points of great importance on account of smallpox, yellow fever and plague prevailing in those places a greater part of the time. The Isthmian ports are destined, however, to be the points from which the infection of the Pacific Arena with yellow fever is most likely to occur.

The Alaskan ports are in the same class with those of Manchuria and the Straits or Malay Peninsula Settlements, being only tributary to recognized Trans-Pacific routes.

It will be seen from this general mention of the present and prospective trade in the Pacific Arena and its probable effect upon quarantine conditions, that practical and successful measures to meet said conditions must be operated upon a schematic system. This schematic system should be devised with a view to its being

conducted from a central or vantage point. This vantage point may be considered and termed as strategic, and as such will now be described.

The geographical location of Hawaii, its large and increasing sugar output, its growing foreign trade, its natural advantages as a naval base and military mobilization point, and finally its convenience as a general coaling station and port of call, cause it to be almost a commercial necessity in the Pacific Arena.

The same reasons which make it a commercial necessity make it a quarantine necessity.

Hawaii is the natural strategic quarantine base in the Pacific Arena and the more the commerce increases the more will this fact be realized and appreciated by the commercial and sanitary interests alike. It is exposed to diseases of every description from every land, and occasionally it may have disease of its own to export, despite the precautions which are constantly taken, and taken, too, in a measure commensurate with Hawaii's importance. But as a "clearing house" or "fender" for disease in transit across the Pacific it will ever render incomparable service to the Pacific Arena, and after the completion of the Panama Canal, to other parts of the world as well.

Hawaii has suffered in the past from three epidemics, one of smallpox, one of plague, and one of cholera, so that the inhabitants individually and collectively appreciate the value of careful quarantine and thorough internal sanitation.

Perhaps in no other city in the world are so many people ready to lend so much moral and financial aid to rational quarantine and sanitation. So that in rating Hawaii it should be considered as a quarantine center or sanitary sieve, not a disease center of export nor import.

PRAEDIAL LARCENY AT JAMAICA.

A bill dealing with praedial larceny in Jamaica is about to be introduced into the Legislative Council of the colony, and at a recent meeting of the Agricultural Society, the Governor gave some indication of the main provisions of this bill. It is proposed that any persons found with agricultural produce, and who cannot give a satisfactory account of how it came into their possession, may be liable to arrest on suspicion, and the onus of proving their ownership to the article challenged rests on the suspected persons. Further, it provides that, besides the police, other authorized persons, such as magistrates, district constables, persons nominated by branch Agricultural Societies, and others appointed as special constables shall have the right to arrest persons whom they have reason to suspect. It will be seen that the proposed enactments are very stringent in nature, but praedial larceny has largely increased in Jamaica of late, and demands drastic treatment.—*The Agricultural News*, Jamaica.

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

Division of Entomology.

DIVISION REPORT FOR JULY, 1908.

Honolulu, Hawaii, August 1, 1908.

To the Honorable Board of
Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—I have the honor to report herewith upon the work of this Division during the month of July.

Inspection.—Of the 30 vessels boarded we found 23 to have brought matter subject to our inspection in the mails, baggage and freight. The result of the inspection is shown in the following table:

NO. OF		DISPOSAL.
LOTS.	PARCELS.	
659	9920	Passed as free from pests.
7	12	Fumigated. These were principally orchids and other plants from the Orient having live scale bugs and aphis on them.
8	127	Burned. Scabby potatoes, wormy turnips and peaches from the U. S. Also wormy sweet potatoes and mealy bug infested plants from the Orient brought by immigrants.
1	6	Refused landing in accordance with Board regulations prohibiting importation of fresh fruit from the Orient.
675	10,065	Total examined.

POSSIBLE PESTS INTERCEPTED AND DESTROYED.

Orchid Pests.—Scale bugs (Diaspinae), stem borers and a colony of black ant were collected on a lot of Dendrobium

(Orchids) brought from Manila by the "Sheridan" on the 5th. We fumigated the plants to kill the scale and hand-killed the borers. The only adult borer found was killed in a cyanide bottle and placed in the collection for subsequent determination. The ants were preserved in alcohol and sent to a specialist to be named.

Scabby Potatoes.—A Japanese merchant not yet familiar with our practice of excluding scabby potatoes had a lot of 100 sacks of badly infested potatoes come from Seattle on the 6th and at our instance destroyed. His petition to be allowed to feed these potatoes to pigs was refused for tactical reasons and because, as Dr. Cobb has proven, spores are not rendered inocuous by passing thru the alimentary canal of an animal.

Mango Aphis.—Mr. McIntyre, of the Moanalua Gardens, returned from Manila on the 31st, bringing with him 5 wardian cases, with 20 mango plants in each, one with twenty-four mangosteen sprouts, several packages of mango seeds, and four dozen mangosteen fruit. The last was refused admission in accordance with Board regulations prohibiting importation of fresh fruits from the Orient. Some of the mango plants were found infested with aphis and all the cases were fumigated with hydrocyanic acid gas. The mango seeds were inspected, found apparently pest free and passed. The soil in the pots was originally taken from here, and, in accordance with your instructions, was kept in screened houses while in Manila. A letter from the officer in charge of the Botanical Gardens, Manila, brought by Mr. McIntyre and placed on our files, testifies to that effect. Upon examination nothing was found in the soil liable to become injurious and it was passed.

Rice.—Formerly the rice coming here from Japan during July, August and September used to be heavily infested with a variety of pests. We have kept close watch on all incoming rice during the month and found it invariably clean. This is a result of the Board's fumigation campaign.

WORK OTHER THAN INSPECTION.

Professional Visits.—On the 13th I went to the Peninsula on request to ascertain the relation between the fruit and the insect found in unusual numbers in ripening figs. Upon examination several overripe figs were found adhering to the tree and in these a host of those beetles (Philonthidae) so common here in decaying fruit. So abundant were these beetles that at the slightest jar of the tree numbers of them would fall out and drop onto what was below them. The owner was written to and instructed to remove the infested fruit and drop it into kerosene and thus destroy most of the beetles as well as their habitation.

On the 18th we visited a garden in the city on request to account for the death of a citrus tree. The plant was found to

have been ringbarked at the crown by crown rot. This disease is common here on citrus trees and is made especially obnoxious by the system of irrigation in practice. Diseases of that nature thrive best in moisture. Evidently then, to reduce losses from crown rot water should be applied to plants in a way that it will not come in immediate contact with the trunk. It is not needed there anyway, since the finer rootlets which are alone engaged in the absorption of moisture are at the extremities of larger root branches, and lie at some distance from the main trunk.

Miscellaneous.—Two colonies of live useful insects from the Orient were taken care of for the H. S. P. A. A brief resumé of the Division's work during the year ending June 31st was drawn up for incorporation in the Governor's report to the Secretary of the Interior.

A collection of a rare Mountain Ohia (Samoan), fig-shaped and red in color, grown at Maunawili, mas brought by Mr. W. M. Giffard for exhibition. It was preserved in a jar and placed in the exhibition room.

Staff.—The Inspector's Assistant returned from the Orient and reported for duty on the 12th.

Respectfully submitted,

JACOB KOTINSKY,
Acting Superintendent.

DIVISION REPORT FOR AUGUST, 1908.

Honolulu, Hawaii, September 1, 1908.

To the Honorable Board of
Commissioners of Agriculture and Forestry
of the Territory of Hawaii.

Gentlemen:—I have the honor to report herewith upon the work of this Division during the month of August:

INSPECTION.

We boarded 29 vessels and found 15 of them to have brought matter subject to our inspection in the usual channels. The result of the inspection is shown epitomized in the following:

TABLE OF INSPECTION.

NO. OF LOTS.	PARCELS.	DISPOSAL AND CAUSES.
488	11,042	PASSED as free from pests.
15	76	FUMIGATED either as a precaution as in the case of plants from the Orient, or to kill scale-bugs on fruit.
17	36	BURNED. These were either small lots of fruit partly decayed and excessively infested with insects, or cut flowers infested with red spider and aphis.
520	11,154	TOTAL examined.

Full records of each of these cases are on our files ready for reference at a moment's notice.

HILO INSPECTION.

On August 27th, Bro. Matthias, your inspector at Hilo, writes:

"The following will give you an idea of the inspection done in Hilo during the month of August:

"Three thousand packages were passed. Three boxes apricots and one box peaches being in bad shape were burnt. Ten boxes pears were infested with codling moth larvae. To make the loss as little as possible, assorted them, destroying the infested lot and passed the others.

"A lot of rose bushes showed traces of *Diaspis rosae*; passed them after being fumigated and dumped adhering soil into the sea.

"Fifteen packages of seeds came through the mail and were all passed."

INSPECTION NOTES.

PRIVATE PICKING.

It is an established fact in our practice that fruits and plants collected by private parties in their own gardens or orchards and sent to friends here we are almost invariably obliged to burn owing to heavy infestation with hosts of pests. Such people would avoid much trouble and expense by sending none but clean, pest-free products.

TURNIPS.

We are somewhat engaged in a campaign against the grade of turnips shipped here. With very few exceptions these are heavily infested with the cabbage maggot (*Phorbia brassicae*) and bear, in addition, heavy mats of fine rootlets more or less mixed with soil. As yet this fly is not known in Hawaii and it is

to our advantage to keep out. The matting of roots and soil is not safe. Such are, therefore, invariably condemned either to be burned or returned. In the majority of cases the former is chosen by consignees. We are determined to insist upon absolutely clean, pest-free turnips.

ARGENTINE ANT.

The so-called "Argentine Ant (*Idiomyrmex humilis,* Mayr.) because of the country of its supposed origin, was recently reported discovered in and about Oakland, California. The discovery is important because during the four years of its presense in Louisiana, the first state of the Union invaded by it, it has proven to be a most formidable household pest, tho it is apparently quite injurious also to horticulture. I gather this information from a paper in the first number of the Journal of Economic Entomology, a new periodical, by the Louisiana State Entomologist, who made careful observations on its habits. The discovery is important to us because the locality is so near the port from which we receive most of our supplies and are therefore in danger of an early invasion by the pest. That the discovery is authentic we had recently confirmed by specimens and letter from Mr. E. M. Ehrhorn, the California Entomological inspector. The condition requisite for the insect to be established here is that a complete colony, including a mated queen, be brought over. Such a colony would be located either in the ship or in the cargo. Were the ant to confine its life among plants we could be reasonably certain of keeping it out. But since it is more likely to locate in groceries and just as likely to be in lumber or hardware cargo, the question assumes a different aspect. It is up to the grocers to look out for the pest perhaps more than upon anyone else.

STAFF.

Mr. G. A. Jordan, the Inspector's assistant, tendered his resignation on the 15th. It was accepted by your President and Committee on Entomology and Mr. D. B. Kuhns appointed in his place.

VISITORS.

Dr. Filippo Silvestri, an Italian entomologist of world-wide fame, paid us a two weeks' visit. He came over from the States specially to make a study at close range of the work of the Territory in fighting its insect pests by means of their natural enemies. He left very enthusiastic over our work and much gratified with the visit.

Very respectfully,

JACOB KOTINSKY,

Superintendent.

BOARD OF AGRICULTURE AND FORESTRY.

Division of Forestry.

ROUTINE REPORT.

September 16, 1908.

Board of Commissioners of
Agriculture and Forestry,
Honolulu, Oahu.

Gentlemen:—I beg to submit the regular report of the Division of Forestry for the past two months.

During this period the special points of forest interest are the appointment by Governor Frear, on July 22nd, of the Territorial Conservation Commission of Hawaii, the inauguration of systematic tapping tests in the rubber plantations at Nahiku, the beginning of actual planting in the new experimental garden in Makiki Valley, and the distribution from the Government Nursery of a considerable number of plants of Mocha Coffee, an important new introduction to the Territory.

TERRITORIAL CONSERVATION COMMISSION.

The Territorial Conservation Commission of Hawaii is one of the several state commissions that have been appointed at the suggestion of President Roosevelt following and as one of the results of, the conference of Governors held at Washington last May. The object of the Commission is to investigate the natural resources of the Territory and in coöperation with the National Conservation Commission and with the commissions of other states to assist in drawing up a plan for the rational use of the material resources of the nation as a whole. Governor Frear has appointed me as Chairman of the Commission. The other members are Messrs. W. O. Smith, Alonzo Gartley, W. F. Dillingham and Jared G. Smith.

CO-OPERATIVE RUBBER EXPERIMENT.

Two years ago during an investigation by this Division of the planted forests on Kauai, there was brought to public attention the existence of two groves of rubber trees on the Island of Kauai. Arrangements were at once made to conduct experiments in tapping in these groves. As the Federal Experiment Station had a man available for the work, which this Division then did not, the investigation was turned over to that office. The results of the investigation have just been published as Bul-

letin No. 16 of the Federal Experiment Station. This Bulletin contains much valuable information and is an important contribution to our knowledge of rubber in Hawaii. Much however still remains to be done before the rubber industry can be regarded as firmly established. Especially important at present are accurate figures on the cost of collecting the latex and putting it into shape as a market product at a profit. To secure data on these points this Division has undertaken coöperative experiments with the Federal Experiment Station and with the four rubber companies at Nahiku. The Federal Experiment Station furnishes the agent in local charge, the rubber plantations furnish laborers to do the actual work, and this Division pays the salary of the agent in charge and the incidental expenses.

The four main points to be investigated are:

First: The cost of tapping;

Second: The best methods of tapping;

Third: Methods of chemical control, especially in dealing with scrap rubber; and

Fourth: The effect of cultivation and fertilization on the growth of the trees and the yield of latex. The tapping will be carried on on a sufficiently large number of trees and for a long enough time to give results that shall have direct commercial bearing. The chemical work will be carried on by the chemist at the Federal Station in the laboratory of the station at Honolulu, there being a sufficient number of trees on the Experiment Station Grounds to yield the necessary quantity of latex for this work. One of the most striking things about the plantations at Nahiku is the way in which the trees have responded to cultivation. One of the objects of the experiment will be to ascertain how cultivation and fertilization may most judiciously be employed to hasten the growth of the trees and to increase the flow of latex during the tapping season.

PLANT INTRODUCTIONS.

During the past three months satisfactory progress has been made at the Experimental Garden at Makiki Valley. Within the past year seed of many valuable plants new to the Territory have been received by this Division. Many of these plants carefully propagated at the Government Nursery have already or soon will be planted in the Makiki Garden where they can be regularly observed and from whence in time seed and cuttings can be distributed.

MOCHA COFFEE.

Some little time ago Mr. G. R. Ewart brought from Mexico the seed of the Mocha Coffee. This shipment has been propagated at the Government Nursery—the first time this plant has

been successfully grown in Hawaii. Over 900 plants have been sent out to persons interested in coffee growing, selected by Mr. Ewart. A limited number of plants remain which will be retained by this Division, planted in the Makiki Garden, and used to produce seed which in due time will be given out. At the present time the Division has no more Mocha Coffee plants for distribution.

ROUTINE WORK.

During the month of July and the first part of August my own time was mainly occupied with routine duties in the Honolulu office, having to do with the preparation of the Annual Report of the Board for the calendar year 1907, which is now in the hands of the printer; with correspondence in regard to the projected Arbor Day and other tree planting; with the compilation of forest statistics for the use of the Territorial Conservation Commission and with the regular routine work in the Division. On August 23rd, I went over to Hawaii to make examination of certain Government Forest Lands in the district of Puna for which an application for lumbering had been received from the Hawaiian Mahogany Lumber Company. As this section of Puna has been little explored it is necessary to cut numerous trails through the heavy woods before an accurate idea of the country can be had. A number of such trails had been cut prior to my visit which enabled me to make a partial examination of the tract. But before I submit a report on the area I desire to see more of the country. . Accordingly I plan to return to Puna in about a month of six weeks, by which time additional trails will permit me a more complete inspection of the forest. My report on the Lumber Company's application will therefore be postponed until after that visit.

In connection with the trip to Puna I was able to make an inspection of the last work done by the Lumber Company in the Koa forest on Keauhou and in the Ohia belt on the Mackenzie Settlement Association lots, beside looking into one or two other forest questions near Hilo.

On September 5th, I joined Dr. E. V. Wilcox, Director of the Federal Experiment Station, and F. T. P. Waterhouse, at Kahului, Maui, and proceeded to Nahiku where we spent several days in looking over the situation and arranging the details of the coöperative rubber experiment described above. Returning overland to Haiku we had an opportunity to examine the dying forest in the Koolau District, collecting some specimens of the work of the fungus which on arrival in Honolulu were turned over to Dr. Lewton-Brain for identification.

While on Maui we also made a hasty trip into the Kula District to observe the conditions following the long drought and to

enable Dr. Wilcox to get a general idea of the agricultural possibilities of that portion of the island.

From August 6th to 15th, Mr. Haughs was on the Island of Kauai making investigation of the planted forests on that island and looking up other forest matters of general interest. His report on September 1st gives the details of his trip.

CHANGES IN OFFICE STAFF.

On August 18th, Mrs. Katherine Hannestad Kolb, who had for some months past served as general clerk and stenographer for the Board, resigned her position. This position will hereafter (in the absence of Miss Peterson) be filled by Mr R. Irwin who had previously been employed as special clerk, since August 8th. On August 13th Mr. Herbert L. Kinslea was appointed clerk of the Division of Forestry to continue the work formerly attended to by Miss Eleanor B. Wirt.

Respectfully submitted,

RALPH S. HOSMER,
Superintendent of Forestry.

CHANGE IN THE PERSONNEL OF THE BOARD.

On Sept. 10 Hon. George R. Carter handed to the Governor his resignation as a member of the Board of Agriculture and Forestry, because of his coming absence from the Territory during a year of travel. On Sept. 15 Governor Frear appointed as his successor Mr. H. M. von Holt. Mr. von Holt appeared for the first time as Commissioner at the Board meeting held on Wednesday, Sept. 16.

HONEY-PLANTS.

The Texas Agricultural Experiment Station has recently issued an excellent bulletin on the Honey-plants of the State. The work is largely written by Messrs. Louis and E. E. Scholl, though other expert writers have contributed. Bee-keepers generally should find this bulletin of great use for determining the nomenclature of honey-plants and ascertaining their respective value.

INSECTS IN THEIR RELATION TO AGRICULTURE.

Delivered before an Evening Class for Farmers, College of Agriculture, Territory of Hawaii, February 25th and 28th, 1908. Illustrated by lantern slides.

By D. L. Van Dine.

Lecture I.

Authoritative writers have made the statement that ten per cent. of all farm crops are destroyed by insect pests. As this amount represents the average loss, then the loss in some instances must far exceed this. Actual figures would be startling. The farm crops of the United States amount to hundreds of millions of dollars and ten per cent. of this immense sum is destroyed by plant-feeding insects. Is there any wonder that there has developed a science of economic entomology? The importance of insects in their relation to agriculture has given the study of injurious insects and the problem of their suppression a permanent place in every well organized agricultural institution throughout the world. I appreciate the honor of first presenting the subject to you, the first students of the College of Agriculture of Hawaii.

If this age in which we live stands out in the future history of the world for any one thing, it will be the universal application of the results of scientific research for the betterment of man's condition. The application of the science of entomology to agriculture has made it possible to extend the cultivated area of the world's surface and increase many fold the returns from the soil. The development of economic entomology has been in direct proportion to the farmer's ability to understand, appreciate and apply the results of the work of the investigator. Profitable returns from agricultural operations depend upon an understanding of this subject. It will not be your privilege to go deeply into the study in a well outlined course of an extended period. The most I can do in a brief consideration of a very long subject will be to attract your attention to one phase of modern agriculture, your knowledge of which will depend for the most part on your own powers of observation and your ability to obtain aid from books and official publications that will help you.

Before we can deal with any particular insect-pest problem successfully, something must be known of the general subject. In number of species and individuals, the insects exceed all other animals combined. Numerically, as well as economically, they command our attention. It is to be hoped that your interest, aroused through necessity, will carry you further than the economic phase of the subject. If it does,

you will find a study that will give you hours of an intensely interesting occupation and leave you satisfied that you have gained recreation and information apart from business and business cares.

All life is divided into two great kingdoms, the kingdom of animal life and the kingdom of plant life. We readily recognize the members of these two kingdoms and will avoid definitions. I want to call your attention to the inter-relations and the inter-dependence of these divisions of life for it is not the insects but their relation to plant life, that forces our attention to the subject.

If it were possible for all the offsprings of a certain species of animal to thrive, mature and in turn reproduce its kind and this could continue indefinitely, there would in time be absolutely no room on this earth for any other species. If all the seeds of any one kind of plant were to germinate, grow to a normal plant and develop seeds in turn and if this process could continue uninterruptedly, in time that plant would occupy the land to the exclusion of all other plants. This condition of affairs does not exist and a consideration of why a particular species of animal or kind of plant does not predominate to the exclusion of all others, gives us an insight into the inter-relations of plants and animals.

The great struggle of all life is to live. After reproduction, the fundamental requirement is food. Indirectly all animal life is dependent for food on plant life. When the conditions are favorable for the growth of a certain plant, then, proportionally, as regards the fundamental requirement of food, the conditions are favorable for the increase and development of the plant-feeding animals dependent upon that particular plant for food. The more abundant the food, the greater will be the increase of the feeders until the very numbers of the plant-feeding animals,, will, by their continued feeding, begin to decrease the numbers of the plant. The decrease in the numbers of the plant might continue until there would not be sufficient food for the plant-feeding animals and this would bring about a decrease in the number of animals. This decrease in food might continue until the plant was exterminated and this would threaten the extinction of the species of animals requiring that particular plant for food. In a state of nature, the problem is not as simple as stated and actual depletion of food, that is total destruction of plant life and consequent extinction of animal life, rarely occurs. The struggle is not wholly one of animals against plants but is complicated by many other factors, namely, the relations of animals among themselves, the struggle of plants among themselves, temperature, moisture, altitude, dryness, etc., so that, excesses in increase or destruction are not possible. In other words, there is maintained in nature between plants and ani-

mals a balance. And not only is there a balance between plants as opposed to animals but there is a natural balance within the two kingdoms of life. For example, if a plant-feeding species of animal increases because of an abundant food supply, provision for an increase of the parasitic and predaceous enemies of the plant-feeding animal is brought about and its increase checked. As regards plants, only a very small per cent. becomes established. The seeds of some do not find a foothold in the soil, some are destroyed and many that eventually reach the soil do not germinate and others find their place already occupied by other plants and are crowded out. Other plants that germinate and have room to grow are killed by heat or cold, or lack of moisture. All this is what is termed the "balance of nature." This balance is destroyed in the more or less artificial conditions surrounding animals under domestication or plants under cultivation. This brings us to the economic phase of the subject, but before considering that we will pass to the general discussion of insects.

The term "insect" has a certain meaning to you. It is synonymous, no doubt, to "bug," or "pest," "blight," etc., and these like all common terms are more or less inaccurate. The conception is probably that one or all terms apply to anything that crawls or to any minute organism, or, even, in the case of an unrecognizable injury to plants, to an agent of an unknown nature, the injurious "bug" or "blight" being some mysterious unseen organism that will reveal itself only to those versed in the science of the subject. I want to assure you that insects are tangible. Science has revealed them and their work to us and the information on the one hand, and the insects on the other, await our study and observation.

The insects comprise a low class of animals known as Hexopoda or Insecta. Hexopoda refers to the chief distinctive characteristic of insects, that is, their possession of six feet. Insecta refers to the segmentation of the body or "body-rings." The term "bug" is correctly applied only to a certain sub-order of insects of which the predaceous plant-bugs, the water-boatmen, and the bed-bug are examples. "Blight," as applied to insect injury, is incorrect, it being the common name of the fungus diseases of plants, these being low orders of plant life. Zoölogically, insects are closely related to the mites, the spiders, the scorpions, the centipedes, etc., but aside from having six feet, are further distinguished from them by having the body divided into three well-defined parts and those parts supplied with certain characteristic appendages. If we had the time and were provided with some low-power microscopes and some dissecting needles, we would collect some representative species, a grasshopper perhaps, and determine these parts. It would help us to understand its adaptability to its surroundings and mode of life. The slides which I have to show you are but a poor substitute.

The three parts of the body of an insect are the head, the thorax and the abdomen. The first division of the body bears the antennae or "feelers" and the second division bears the legs and wings. The third division or abdomen is made up of a series of segments or "body-rings." The skeleton of an insect is external, that is, the body is supported and protected by a hard shell-like outer covering. This hard covering is called "chitin" and is so deposited in certain places as to form a hard and resisting surface, while in other places, it is flexible enough to permit of a free movement of any one part or the movement of the body as a whole. This hard outer covering of an insect is shed from time to time during the young, or developmental, period of the life of an insect. This process is called "moulting" and provides for increase in size or growth since the chitin is inflexible.

The mouth-parts of an insect are of interest to the economic student of entomology for by determining the type of the mouth of any particular insect, we know the nature of the injury in the case of a plant-feeding species. The two important types of mouth are first, those which are formed for biting, and, second, those fitted for sucking. These are well illustrated by the slides. Insects possessing biting mouth-parts actually bite off or gnaw into, masticate and swallow the portions of the plant they feed upon. The mouth-parts of beetles and grasshoppers offer examples of this type.

In such insects as leaf-hoppers, plant-life, and scale-insects, the mouth-parts are formed for piercing the tissues of plants and sucking therefrom the sap or juices. The portions of the plant fed upon are left intact but the result of the myriad of small pumps sucking out the very life of the plant, can be imagined.

The organs of digestion consist of the alimentary canal and its appendages. The alimentary canal runs the entire length of the body in almost a direct line. It is separated into definite parts and supplied with various structures. The shape and size of the parts and the presence or absence of certain supplementary structures depends upon the feeding habits of the insect to a great extent. Necessarily the digestive system of a chewing insect that takes into its system portions of a plant would differ from that of a sucking insect that feeds upon juice or sap.

All insects undergo during their life remarkable changes in form, structure and habits. With some, as the moths and butterflies, the change of form from the young to the adult stage is complete. These insects after hatching from the egg have three distinct stages or periods of development, that is, the young, or larval stage, known commonly as the caterpillar, grub or maggot, during which time the insect takes the most food to provide for growth; the pupa, a period dur-

ing which the insect transforms from the caterpillar, grub or maggot stage to the winged adult form; and the adult insect as usually recognized.

With those insects not making a complete change of form during their development, the young on hatching from the egg resemble the parent or adult in possessing the three distinct divisions of the body, the three pairs of legs, and other characteristics of the adult insect, with the exception that they are smaller in size, lack wings and are otherwise immature. Insects of this type are illustrated by the grasshoppers, the cockroaches, and the leaf-hoppers.

I trust some of the things that I have said and the slides that I have shown you will attract you to a consideration of insects as a class. This is but a very brief introduction and, in so far as the general subject is concerned, I must leave you to better the acquaintance. I do not believe a zoölogical classification or technical descriptions will serve your purpose at the start. I would urge you to study insects as you find them, in relation to their surroundings and to themselves. Points in common will after a time appear to you and then their classification will naturally follow. It remains to consider next insect injury and insect control.

HONEY FOR CANNING.

So far I have used honey for canning fruit only in a small way, but have watched the results carefully, and am fully convinced that it can be used in place of sugar for any kind of fruit with much better results than if the sugar were used. When using honey I have never had a can spoil, and have always found the fruit far better and richer than that put up otherwise. We have been eating some peaches this winter that were put up three years ago, and in that time we have moved once. I would, therefore, advise those wishing to try the honey to do so by all means.

Formerly, when I canned strawberries I took two quarts of good firm berries, just from the vines, stemmed them late in the day, rinsed them quickly in cold water, and drained in a colander until I could prepare another can. I put them in a stone crock and covered them with a cup of granulated sugar and set them in a cool place until morning. I then put them on the stove, boiled them well, and canned them. With this amount there is enough to fill a quart Mason jar, and a little over for a taste. When using the honey in place of sugar the same method is followed except that only half a cup of honey is used, which is poured over the berries so that it goes down through and all around them. We are careful to use good fruit, as one over-ripe berry may spoil the whole lot. Cherries, raspberries and blackberries may be canned, using about half the amount of honey that would ordinarily be used of sugar. The larger fruits, such as peaches, pears, quinces, etc., are also improved by the honey.

Fruit must be handled right in order to be good, and we must be free from other duties while canning it. A very safe rule is to follow whatever plan has been found successful, substituting half the amount of honey for the sugar. I am sure no one will be disappointed.

For cooking purposes, making pickles, etc., honey is just fine.—Correspondent in *"Gleanings in Bee Culture."*

TRANSPORTATION FACILITIES OF HAWAII.

By H. P. Wood.

[From the Report of the Governor of the Territory for 1906.]

From an isolated port, away in the midst of a lonely ocean, Honolulu has grown in importance with the rapidly developing commerce of the Pacific until it is now at the cross roads of a traffic that is developing faster even than men and money can supply the ships necessary for its accommodation.

Seward's prophecy is rapidly being realized. The shores of the Pacific are enjoying unrivalled prosperity and the waters of this great ocean are now being plowed in every direction by huge freighters and modern passenger steamships and all, or nearly all of these engines of commerce, find it desirable to call at Honolulu which, being in touch with the mainland by cable, is a convenient port of call for coal and orders, and must develop into a great clearing house for Pacific ocean commerce.

The wharfage facilities of Honolulu are ample and convenient for a very large commerce.

The pilot service of the port is excellent, vessels being met and anchored in all kinds of weather. There is also safe anchorage and good holding ground off the harbor.

Full lines of ships' supplies are carried by Honolulu merchants; prices are reasonable, deliveries being made alongside vessels.

The water supply is good, cheap and easily obtained; large supplies of coal are always on hand and for sale at reasonable prices.

The different islands and leading sugar ports of the group are connected by an excellent system of wireless telegraphy.

There is a good marine railway at Honolulu, capable of handling vessels up to 1,500 tons in light ballast.

A modern dry dock, with capacity for the largest ships afloat, is a matter of only a short time.

The port of Honolulu is guarded by a completely equipped quarantine station, provided with buildings and appurtenances sufficient for the proper handling at one time of over 2,500 people.

Distances for full powered steam vessels from Honolulu to the leading ports of the Pacific are as follows:

	Miles		Miles
Acapulco	3,310	Punta Arenas	6,379
Apia	2,240	Sandakan	4,980
Auckland	3,850	San Diego	2,280
Callao	5,147	San Francisco	2,100
Cape Horn	6,488	San Pedro	2,232
Guam	3,337	Seattle	2,401
Guaymas	2,696	Sitka	2,396
Hong Kong	4,961	Sydney	4,424
Levuka	2,736	Tahiti	2,389
Manila	4,803	Ualan	2,445
Melbourne	4,940	Unalaska	2,016
Pago Pago	2,263	Valparaiso	5,916
Paita	4,777	Victoria	2,343
Panama	4,666	Vladivostock	3.721
Petropavlovsk	2,782	Wellington	4,163
Portland	2,318	Yokohama	3,445

Regular steamship connection is had today with Japan, China, Australia, New Zealand, Samoa, Tahiti, Vancouver, British Columbia and with the cities of Seattle and San Francisco on the Pacific Coast of the United States, as well as with Salina Cruz, the western terminus of the Tehuantepec Railway, which bids fair to become one of the world's great trade routes.

The sailings for Honolulu from Vancouver, B. C., are monthly. Passenger steamers leave San Francisco about every five days.

The fare (first class) from Pacific Coast ports to Honolulu is from sixty dollars ($60.00) to seventy-five dollars ($75.00). One hundred and ten dollars ($110.00) to one hundred and thirty-five dollars ($135.00) for the round trip; rates by sailing vessels much lower:

Fare, Honolulu to—

Suva, Fiji	$100.00
Brisbane	150.00
Sydney	150.00
Auckland	150.00
Yokohama	150.00
Shanghai	175.00
Hong Kong	175.00
Manila by direct steamer	175.00
Manila via Hongkong	22.00 Additional

The different islands, comprising the Territory of Hawaii, are served by the steamships of the Inter-Island Steam Navigation Company, which has a fleet of about 17 steamers, the home port being Honolulu.

The boats are modern, of good size, well officered, set excellent tables and afford rapid and frequent communication between the islands.

Table of Inter-Island Distances and Fares.

Honolulu to	Nawiliwili, Kauai,	distance	98	miles,	fare $	6.00
"	Koloa, Kauai	"	102	"	"	6.00
"	Waimea, Kauai	"	120	"	"	7.00
"	Hanalei, Kauai	"	125	"	"	7.00
"	Lahaina, Maui	"	72	"	"	5.00
"	McGregor's, Maui	"	84	"	"	6.00
"	Kahului, Maui	"	90	"	"	6.00
"	Hana, Maui	"	128	"	"	7.00
"	Mahukona, Hawaii	"	134	"	"	10.00
"	Kawaihae, Hawaii	"	144	"	"	10.00
"	Kailua, Hawaii	"	178	"	"	10.00
"	Hilo, Hawaii	"	192	"	"	12.50
"	Punaluu, Hawaii	"	250	"	"	13.00

The roads leading from all of the steamship landings are excellent, the most out of the way places on each island being readily and easily reached by horse, carriage or automobile. Horses and vehicles for hire are readily obtainable at all times and on all of the islands at reasonable rates.

There are five lines of railway within the Territory of Hawaii. The Oahu Railway & Land Company operating between Honolulu and Kahuku, 71.3 miles, with a branch some 11 miles in length, running from Waipahu to the pineapple plantations of Wahiawa. At Kahuku, a connection is made with the Koolau railway, adding some ten miles to the length of the road. This railway system has opened up thousands of acres of rich sugar lands and handles a very large freight.

On the island of Maui, the Kahului railway connects that growing port with the interior sugar belt.

The island of Hawaii has two lines of railway. The Kohala railway, about 25 miles in length, serves the sugar plantations of the district, the terminus of the line being at the port of Mahukona. The Hilo railway, which now connects the second city of the Territory with a portion of its tributary country, promises to be the leading railway enterprise in the islands and if the plans of the promoters are carried out, which now seems very probable, this line will not only tap the sugar lands of the Hilo and Hamakua districts, but will also serve to open up a great many thousand acres of productive territory, the development of which will tend to make of Hilo a place of considerable importance, commercially.

In a recent letter Mr. O. P. Austin, chief of the Bureau of Statistics of the Department of Commerce and Labor, says:

"A section able to produce such a variety of tropical articles as may be produced in the Hawaiian Islands, and having free access to a market demanding such enormous quantities of those various articles as does the market of the United States, ought to become not merely prosperous, as it already is, but one of the most prosperous and perhaps the most prosperous of all the tropical communities of the world."

The full realization of this prospect is of course absolutely dependent upon adequate transportation facilities.

Steamship communication between the different islands and with the ports of the mainland has witnessed a great improvement during the year just passed with an absolute certainty of early additional betterment.

The building of macadamized roads, belt lines and feeders, is being pushed on all the islands of the group.

In fact, every local interest seems to be united in a determined effort to place Hawaii's transportation facilities on a par with her almost unlimited agricultural possibilities.

WOOD PRODUCTION IN GERMANY.

Among all the nations of the world Germany receives the credit of being the most thoroughly scientific. She does with her limited natural resources what younger nations will soon be compelled to do in self-protection; she conserves them.

When our wood supplies are within sight of their end, and sawmills that have been moved from the white pine belt of the north to the yellow pine belt of the south, have been moved to the Pacific Coast for their last stand, then Germany's scientific forestry policy will receive better recognition.

We do not think of moving a grist mill about from one wheat field to another, as the fields in turn become exhausted. After one crop is harvested another is coming on. So it must be with the sawmill and the crop of trees. If it takes 50 years to raise a tree of a given species, then one-fiftieth of the forest may be cut each year, provided it reseeds or is replanted —and the sawmill stays at the same place and the workmen live in their permanent homes near by; the "lumber shanty" will be a thing of the past; raising trees a business like raising wheat.

WHAT FORESTRY HAS DONE.

(Continued.)

The following is reprinted from Circular 140, Forest Service, U. S. Department of Agriculture.

RUSSIA AND FINLAND.

Russia.

Russia's forests are of vast extent. More than 575,000,000 acres, or 39 per cent., of European Russia is forest, and the Siberian forests of Asiatic Russia contain about 350,000,000 acres. In the more wooded provinces of European Russia the government owns about 89 per cent. of the forest land. It owns 65.7 per cent. of the total forest area. In general, the untouched forest resources of Russia comprise two-thirds of the whole forest area of Europe. Over $30,000,000 worth of wood is exported. The principal countries drawing upon Russia are, in order, England, Germany, Holland and France.

From the 660,000,000 acres of state forests which are now being worked the net income is now nearly $21,500,000, or 3 1-5 cents per acre.

Russia began to apply forestry before the time of want had arrived, though forest havoc had been wrought. She was not forced into it for self-protection, as were, for instance, Germany and France. The lessons mastered by such other countries were regarded by the Russian government as convincing enough without being actually experienced. The United States stands in a much less fortunate position with regard to forestry. With us the verge of a timber famine has already been crossed, and we are to know what it means to pay for forest waste. We have mortgaged the future of our forests. Yet it is still possible for us to regain our forest independence.

Attention was first turned to the protection of Russian forests about two hundred and fifty years ago, when Czars Michael and Alexis undertook to settle property rights and make provision against fire and theft. By the beginning of the eighteenth century more careful use of the forests, especially of those yielding ship timbers, was insisted upon by Peter the Great. The more immediate cause which led to the present administration was the forest devastation which followed the abolition of serfdom (1861) and the partition among the liberated serfs of much forest property. Complaints were rife in 1864, and several laws were presently promulgated, the last of which (1888) provides a comprehensive plan for the

conservation of forests, public and private. The worst effects of devastation were felt in the southern districts near the steppes, where the soil and stream flow had been gravely injured by clearings. The law, however, which was passed directly as a result of these evils, applied to all European Russia, and has since (in 1903) been made applicable to the Caucasus, the Trans-Caucasus, and other southern provinces.

Forests which hold shifting sands or protect the shores of rivers, canals and other waters, as well as those which serve to prevent erosion and avalanches in the mountain districts, are classed as protection forests, which may not be converted to agriculture or cleared or used as pasture. If of natural growth, protection forests are free from taxes forever; if planted, they are not taxed for thirty years.

Private forests not classed as protective may be cleared only on certain conditions, which, as a rule, provide for returning the land to forest or at least for offsetting the clearing by growing a plantation.

Over 100,000,000 acres of private forests have been placed under supervision as protection forests.

In each province and district there is a forest protection committee composed of local administrative officers, including one or two foresters, the justice of the peace or other justice, the county council, and two elected forest owners, with the governor as president. These committees decide which forests are "protective" and which are not; approve working plans; direct what clearings may be made, and exercise police powers in coöperation with the local forest administration.

Private forest owners may secure expert advice on forestry without charge. Seedlings are distributed, and working plans for protective forests are made, free of cost. The Imperial Loan Bank advances money on forests for which the government has made working plans insuring conservative management. In this way 7,000,000 acres were mortgaged in 1900.

FINLAND.

Finland has 50,000,000 acres, or 63 per cent. of the whole land area, in forest. It exports each year 170,000,000 cubic feet of wood, valued at $20,000,000, principally to England, France, Germany and Holland.

Most of the forest—that is, between 35,000,000 and 45,000,000 acres—is State property. Since 1869 the State forests have been conservatively lumbered, but until the private forests are depleted it will not pay to make the management as thoroughgoing as it ought to be. Little can now be done beyond restricting wasteful cutting and fires. However, since no trees are cut which are less than 10 inches in diameter 25 feet from the ground, there will be a good stock of timber to count on when the inevitable

rise of wood prices makes intensive management pay as it already pays where the markets for wood are better than the average. Working plans for the forests are constantly being made by a corps of forest surveyors.

Though mainly in small parcels, the private forests contribute four-fifths of the timber exported, in order to furnish which they are destructively overcut. Thus far all attempts to regulate their use have been vain, and they are certain soon to be exhausted.

Clearing along waters adapted for fishing, as well as clearing more than 12 acres anywhere without providing for new growth, have been forbidden since 1886.

CATCHING HOOK FOR POULTRY.

In a recent bulletin of the New York Cornell Experiment Station R. C. Lawry says: "Every poultry farm should have several catching hooks. They save time in catching fowls and prevent much of the fright and injury which usually occurs on such occasions."

He describes a catching hook which is an improvement of an old invention. The improvements described consist in so fortifying and bracing the wire portion of the device that it remains practically rigid, and in so shaping the hook end that the shank of the fowl may be easily caught and effectively held without injury. The only materials required for the construction of the hook are a broom handle and a 6-foot piece of No. 10 steel wire,

which can easily be bent into the proper shape. As the figure shows, the hook end should have a restricted entrance which makes it difficult for the fowl to withdraw its shank, but it should also have a large aperture which gives freedom of action while the shank is held. Rigidity of the wire portion of the hook is obtained by reinforcing it for a considerable part of its length from the handle by a second piece of wire.

In using the hook it will be found that the wire portion is less conspicuous than the wooden handle and that the latter attracts the fowl's attention while the shank is caught by the hook. The fowl is then gently drawn from the flock, and the shape of the hook is such that the foot may easily be released.

PRESERVATION OF ROSELLE FRUIT.

An article in the *Natal Agricultural Journal* entitled 'The Roselle or Jamaica Sorrel' (*Hibiscus sabdariffa*), gives the following note on the preservation of the fruits:

The roselle is well adapted for jam-making, giving a palatable, easily-kept product if put up in earthenware or glass. Unfortunately the fruits contain an acid principle which precludes them being put up as preserves in ordinary tinware, and hence some failures have been experienced in this respect. For pickles the fruit is well adapted, and it makes an excellent condiment.

It has been found that the best method of handling the fruit is to dry it after the removal of the seed pod. The dried fruit has been kept in jars and tins for two or three years in good order. The first preparation that is necessary is the cutting off of the stem of the fruit, and the basal end of the calyx [the calyx is the red-colored edible portion] to where the seed pod is united with the calyx, when a gentle pressure with the fingers will force out the seed pod. Then the fruit should be placed in some roomy, airy position (not necessarily in the sun), in trays or on sheets on the floor, allowing as much air to pass through and over the fruit as possible. In a few days all superfluous moisture will have evaporated, and the dried article can be packed away in jars. By this means roselles can be had in good condition all the year round. All that is needful, when required for use for jam, tarts, etc., is to take the quantity necessary and pour over the fruit a little water, when it will absorb the moisture and resolve itself into apparently fresh fruit. The large grower has in this method a certain way of keeping such surplus fruit as may not be in immediate demand, or which, on account of low ruling prices, he may not wish at the moment to put on the market. Fruit put up in this form might be successfully exported to the London market.

PUBLICATION DATE.

Arrangements are being made by which the date of publication of the FORESTER will be more regular than has hitherto been possible. It is intended in future to go to press on the tenth of each month, in order that the paper may appear upon the twentieth.

THE HAWAIIAN

FORESTER AND AGRICULTURIST

Vol. V OCTOBER, 1908 No. 10

THE ROADS OF HAWAII.

By G. H. Gere, County Engineer, County of Oahu.

[From the Report of the Governor of the Territory for 1906.]

That Hawaii has been no laggard in road construction since the awakening of the people to the benefits of good roads is very apparent to one who will take the time to make the circuit of the various islands.

The rugged nature of country traversed has called for much engineering skill, and the severe climatic conditions have compelled first-class construction. The very boldness of the location adds much to the attraction and enables the traveler to get vistas of picturesque beauty of field, mountain, gorge and sea coast.

Hawaii, the largest island, with its variety of scenery and resources is a constant surprise to the traveler. Her roads have neadly all been built within the last thirteen years. The belt road around the island was opened for wagon traffic in 1903 for the entire circuit, and much has since been done to improve the bad places, so that the whole of Hawaii has a fair percentage of "hard road," good in all kinds of weather for any sort of traffic. The mileage of the "main road," which by common usage has come to mean the "belt road," is divided among the various sections as follows:

Hilo District: 46 miles, 30 per cent. macadam, 10 per cent. earth, 60 per cent. telford, dressed with volcanic earth, making in many cases an excellent road-bed for all weather.

Hamakua District: 30 miles, 10 per cent. macadam and the balance earth.

South Kohala District: 20 miles, fully 50 per cent. of which should be classed as hard road, being dressed with a-a gravel or cinder.

Kona District: 76 miles, all of which is built of natural macadam of a-a. Kona also boasts about 60 miles of side roads, all of which are of the same excellent quality.

Kau District: 59 miles, 18 per cent. macadam, 18 per cent. earth, 44 per cent. a-a and 20 per cent. loose a-a commonly referred

to as "The Kahuku Flow." A portion of the latter is now being closed by the 1907 lava flow.

Puna District: 22 miles, 20 per cent. macadam and 80 per cent. a-a.

Landing at Kawaihae, on the island of Hawaii, at day-light, a carriage can be secured for Waimea. One mile along the beach, through a straggling village, hidden in palms and algarobas, then the road commences the climb of 2,700 feet to the plain, the grade being steady with a 6 per cent. maximum. In the cool of the morning the ride is delightful, the view, as one nears Waimea, is a revelation. On one side is Kohala Mountain, 5,489 feet high, with its green slopes of forest and its rain clouds; straight ahead is rugged snow-capped Mauna Kea, 13,825 feet high; away to the right, Hualalai, 8,275 feet, streaked by the forest and flow, catches the eye and between, in the hazy blue which charms and baffles description, is dome-like Mauna Loa, with a possible cap of snow, standing up 13,675 feet. Between and to the foothills stretch from 15 to 30 miles of comparatively level plain. On a clear day a glance behind will reveal Haleakala, 10,032 feet high, and the coast line of the island of Maui.

A spur of the main road branches from Waimea around the flank of Kohala Mountain, climbing to an elevation of 4,200 feet by a tortuous and crooked mountain road. It then drops by easy grades to the north coast, a distance of 26 miles. North Kohala still clings to earth roads but a change is coming.

The first three miles of road from Waimea towards Kona has never been built, and had better not be attempted except by day-light or with an experienced guide. The prairie is cut by numerous old trails worn deep into the soil and made dangerous by numerous dry wallow holes and many boulders. It is only three miles to the graded road of a-a cinders which makes the heart glad; then 16 miles across the plains to the foothills and the welcome forest; then 9 miles more over the old a-a flows and 1 mile over the '59 flow, with a road to make the autoist crowd the speed limit, brings one to Puuanahulu: 26 miles in all, without a sight of a house and probably without sight of a human being. Only an occasional flock of tame sheep, and after the forest perhaps a few wild ones or a wild turkey or goose are all the life seen besides the forest birds.

Puuanahulu is a ridge of red earth which the voracious lava flows failed to cover. Beyond the ridge are 4 miles more of ragged forest, where the kauila, uhiuhi, the wiliwili and an occasional sandal-wood or other rare variety of tree adds interest, to the edge of the 1801 lava flow. The road crosses this floor on a practically level grade for two miles, then climbs 2 miles of 5 per cent. grade to the opposite side of the flow. Crossing this flow gives one who has not seen a flow of lava a better idea how it travels than can be had in any other way, for in this immense flow, looking in many places as if placed but yesterday, lava chan-

nels can be seen for miles, frequently arched over and making immense caves.

Two miles more of easy ascent tops the Huehue ridge, a shoulder of Hualalai, at an elevation of 2,000 feet. From there the road strikes the mountain at an elevation of from 1,200 to 1,800 feet, through the settlements of Holualoa 10 miles, Kainaliu 8 miles, Honaunau 8 miles, Kalahiki 4 miles, Papa 16 miles, a total of 66 miles of hard, smooth a-a road.

From a scenic point of view there is much of interest in the short stretches of forest, the fields of coffee, sisal, bananas and pineapples, with all the time a wonderful panorama of 40 miles to sixty miles of coast line and villages spread out below, each turn of the road bringing new combinations of color and added charm.

The numerous villages along the beach are connected to the upper road by well constructed roads, the maximum grade being 6 per cent.

These side roads have a mileage of approximately 60 miles, making Kona the banner district for good roads and pleasant drives, for the roads are never muddy and seldom dusty.

East of Papa the road shows the lightness of the travel, but can be classed as good road for perhaps 8 miles when one encounters the more recent flows. Earth and boulder material were scarce and the road-bed is frequently a stretch of loose stones, the size of an egg, worn round by the travel and most trying to the traveler and his animals. One or two autos have managed to cross this stretch by using raw hide protectors on the tires, but travel avoids this stretch, commonly known as the Kahuku flow of '89. It is at present closed to traffic by the 1907 flow, which plowed across the road for a width of a mile or more, and covered it with from 20 to 50 feet of lava.

Once across, however, the road drops rapidly to Waiohinu, a pretty village at the head of the valley, 900 feet elevation, and thence on through Naalehu and down to sea level at Honuapo, the principal port of the Kau district. Here the climb to the Volcano House begins. The road rises 800 feet in the 12 miles to Pahala, over the old a-a flows, through stretches of kukui groves, pasture land and cane fields. The road-bed of a-a and gravel leaves little to be desired. From Pahala the first 6 miles are dirt road, then come 10 miles of macadam over a grass covered pahoehoe flow, and 6 miles of a-a cinder brings one to the end of the constructed road in Kau, a gap of 4 miles still remaining to be constructed to connect with the hard road on the opposite side. This 4 miles is not difficult, however, except in the night time when there is liability of mistaking one of the many abandoned trails for the right one. The last mile and a half leads through a portion of the old crater of Kilauea to the Volcano House, situated on the brink of the big crater, where the pit of Halemaumau is in almost constant active operation.

From the Volcano House, at an elevation of 4,000 feet, the road drops at the rate of 300 feet to the mile, through 9 miles of primeval forest, then through 8 miles of bits of cultivated ground and patches of forest and 5 miles of cane field to the village of "Nine Miles," the headquarters of the Olaa Plantation.

Here a branch road of excellent quality leading into Puna makes a fair day's automobiling and takes one into the land of myth and Hawaiian folk lore, the country of lava, forests and warm springs and beautiful stretches of forest.

The main road from 9 miles to Hilo is a practically level grade with forest and cane field about evenly divided.

Hilo has several side roads to points of interest well worth visiting. The Keaukaha road down the coast, the Kaumana and Piihonua roads which climb mountainwards, the latter passing the famous Rainbow Falls.

From Hilo towards Hamakua an entirely different country is encountered. The even slope of the mountain is cut by deep gulches between which stretch the endless cane fields. The maximum grade of the permanent roadway is 6 per cent. and with the exception of 3 miles at Honolii has all been put on a permanent location.

The road follows close to the coast line, which is a cliff from 100 to 600 feet high with wide detours up the gulches to get the grade. The boldness of the road location adds much to the charm of the drive, for the gulches are filled with tropical vegetation and forest, and the boom of the surf at the foot of the cliffs is never out of hearing. Thirty-one miles to Laupahoehoe and six miles to Ookala bring one to the boundary of Hamakua.

Hamakua roads are of earth as yet, but except in continuous wet weather are excellent for travel. The road varies from an elevation of 800 feet to 1,100 feet above sea level and is from one to two miles from the coast. The average slope of the mountain side is about 12 per cent., so that the roadway continually overlooks a large section of country.

At Honokaa the road turns inland and begins the climb to Waimea, first through the cane fields then through homesteads of coffee and fields into a forest of ohia and fern and then out onto the plains of Waimea. Ten miles across the plains, through herds of cattle, bring the traveler once more to Waimea. From Honokaa a branch of the main road follows along the coast about 12 miles to Kukuihaele village, and ends at the top of the Waipio Pali. From Waipio to Niulii, in Kohala, is a stretch of country as yet unconquered by the road builder.

ROADS ON OAHU.

The island of Oahu has largely confined its permanent road work to the City of Honolulu and its suburbs. Still an effort is being made to make a "hard road" of the belt road. Honolulu

has about 85 miles of macadam streets and roads, 12 of which are a part of the belt road around the island. Ewa district has 12 miles and Koolaupoko 2 miles of macadam, Waialua has three-quarters of a mile and Koolauloa 3 miles of coral road, and the latter district has 12 miles of sandy beach road which is always good so that, of the belt road, 33 per cent. is macadam, 5 per cent. is coral, a total of 38 per cent. "hard road;" 15 per cent. is sand clay road, and 47 per cent. still earth roads.

The circuit of the island is easily made in one day in an automobile. The first 6 miles out of Honolulu up the picturesque Nuuanu Valley brings one to the famous Nuuanu Pali. The descent of the Koolau side is an 8 per cent. grade literally carved out of the cliff in many places for two miles, and here ends the macadam. The 3 miles to the coast from the foot of the pali is dirt road, a pleasure to travel when dry. From Kaneohe the road skirts the coast and is only a few feet above sea level for a large portion of the way. Through the villages of Waikane, Kahana, Hauula, Laie to Kahuku, the towering palis on the left and the blue sea on the right with the fields of rice and taro and cane make a drive every inch of which is enjoyable.

Kahuku to Waialua, 22 miles, is another bad stretch in wet weather, but there are no grades and in good weather the dirt road is excellent.

Through Waialua 3 miles have been covered with a soft coral which makes a fair road, then comes the climb over the divide between the Waianae and Koolau ranges. This has all been reduced to 6 per cent. and under, with the exception of about 1,000 feet of 13 per cent. grade.

The road crosses the Wahiawa plains at an elevation of about 800 feet past the dam of the Wahiawa Water Company and through the famous Wahiawa pineapple plantations and drops again to near sea level two miles west of Pearl City. Here one meets the macadam road again and 7 miles through the cane fields skirting the rice and taro fields of the low lands brings us to Moanalua, the beautiful suburb of Honolulu.

Through the assistance of Mr. J. H. Moragne and Mr. Hugh Howell, county engineers of the islands of Kauai and Maui, the following information concerning the roads on those islands has been made available:

ROADS ON KAUAI.

From Lihue, which is about centrally located with respect to the main road system, the north branch follows along near the coast through the agricultural lands to Wainiha, the objective points and distances being as follows: Kapaa 8 miles, Kealia 10, Anahola 14, Moloaa 18, Kilauea 22, Kalihiwai 25, Hanalei 30, and Wainiha 33 miles respectively. From Wainiha the road continues on 3 miles into Haena flats along the beach.

From Lihue westerly, the main road across the south side of the island, traverses agricultural and pastoral lands near the upper edge of the agricultural lands. The main points of object from Lihue are: Summit 8 miles, Koloa 12, Lawai 15, Eleele 18, Hanapepe 21, Makaweli 24, Waimea 29, Kekaha 32, and Waiawa 38 miles. From Waiawa the road continues to Mana and the Barking Sands, passing along near the base of the mountain through the lands of Kekaha plantation.

There is no connecting road along the north side of the island between the Barking Sands and Haena, owing to the continuous precipitous bluffs which rise directly out of the sea.

The Kauai roads are mostly earth, only about 10 per cent. having yet been macadamized. The earth roads are excellent when weather conditions are favorable, muddy when too wet, and dusty, red dusty, when too dry. Macadamizing at the rate of one mile a month is being carried on by the County forces. Four miles in Waimea district and one and one-half miles in Koloa district of excellent macadam, 16 feet wide, have just been completed and the force is now at work at Lihue.

It is the object of the county government to continue the work of macadamizing until all roads of importance requiring such treatment will have been placed in first-class condition.

No macadam is placed on grades of over 5 per cent., which is the maximum grade adopted by the county. Old grades of disagreeable pitch are gradually being worked out by regrading or relocating. Considerable work of this character is being done in the vicinity of Kilauea, where heavy grades are most numerous.

Experiments with sand-earth road construction are being carried on in Kawaihau district, where material is available which gives such promise of success that it is the intention to continue this method of building mudless and dustless roads throughout the larger part of the mileage of the district.

Waialua bridge, six miles north of Lihue, is being thoroughly overhauled and is receiving a new set of permanent concrete supports and a thorough cleaning and painting. Other important bridges will be similarly treated as they can be reached.

Permanent concrete and stone culverts, pipe drains and drain tunnels are being placed in all improved roadway, and ugly bends in alignment are being eased off.

In the Waiawa-Mana section, where heavy rains flood almost the entire length of road, regrading with deep side ditches is being done.

MAUI COUNTY ROADS.

On the island of Maui alone there are 180 miles of belt road encircling the immense mountains of East and West Maui, and over 100 miles of interior main roads between principal settlements, besides 150 to 200 miles of less important branches.

On the island of Molokai there is practically but one road, the main wagon road, about 40 miles in length, from the eastern end of the island at Halawa Valley to Kaunakakai, and on up to the top of the immense pali overlooking the Leper Settlement of Kalaupapa. A narrow, steep horse trail, closed to the public leads down this pali, a drop of 2,000 feet, to the settlement below. There are two frightfully steep and dangerous foot trails leading from Pukoo over the mountain to the valleys of Wailau and Pelekunu respectively, which are the only means of communication between the rest of the island and these two valleys, which lie between such precipitous walls of solid lava formation from the sea to the heads of the valleys that no living being can scale them, except at these trails which take advantage of every slight projecting knob or hollow, and even run for a considerable distance in the very center of the waterway.

Of the 180 miles of belt road on Maui, 60 miles are around West Maui, running through the important towns of Wailuku, the county seat, and Lahaina, the former capital of the Kingdom of Hawaii, for the most part near the seashore and touching at the steamer landings of Maalaea, McGregor's, Olowalu, Lahaina, Kaanapali and Honolua.

Forty-five miles of this distance is wagon road, the balance is a primitive horse trail, not likely to be much improved in the near future, owing to the expensive nature of construction required, and the scant population along its route.

A little over two miles of the wagon road have been macadamized, and about four miles gravelled, one-half of this having been done during the past year. Much of this road has suffered severely in the past from wash-outs, but damage from this source will be less and less hereafter owing to the more permanent nature of the present methods of construction and the more liberal drainage provided.

The 120 miles of belt road around East Maui are about one-half horse trail and one-half wagon road, of which about 18 miles are macadamized and four miles gravelled. Fully 25 miles of the 60 miles of wagon road require relocation to avoid excessive grades which in many places are as steep as 20 per cent. and even more, and the necessities of travel warrant macadamizing as fast as it can be accomplished, at least 20 miles more than is already completed. Two miles of this have been done during the past year, and it is intended to keep two crushing plants busy during nine or ten months in the year until the remainder is finished.

The chief difficulty with Maui roads is the fact that there is such a large mileage requiring relocation and other permanent improvements beyond the means of current revenue, the cost of maintenance of such roads being larger than that of modern well-built roads of a proper location and easy grade. It will take, in round numbers, $300,000 to make the roads of Maui what they

should be, and at least $200,000 of that amount must be secured from some other source than current revenues in order to get it done in this generation.

The belt road of East Maui runs through all but two of the Maui plantations, the Wailuku Sugar Company, the Kihei Plantation, the Kipahulu Sugar Company, the Kaeleku Sugar Company, the Haiku Sugar Company, the Paia Plantation Company, and the Hawaiian Commercial and Sugar Company, the latter being the largest in the world.

This road also passes through the four recently organized rubber plantations at Nahiku, on the windward or northeast side of the island, where thousands of thriving young rubber trees may be seen on either side.

Outside of the belt road, the most important main roads are:

1. The Paia-Makawao road, 6 miles in length, 2 miles of which have been macadamized during the past year, and one mile and a half relocated to reduce grades to 5 per cent. and 6 per cent.

2. The road from Makawao through Kula, and the Kula Homestead road, leading through the corn and potato lands on the slope of Haleakala, and connecting with the belt road at Ulupalakua. These roads both require considerable regrading.

From Makawao runs the road to the top of the enormous crater of Haleakala, 5 or 6 miles of this being wagon road, but too steep to be comfortable, as far as Olinda, the balance being a horse trail, 8 miles in length, on a 15 per cent. grade, which is marked every 500 feet by guide posts to assist travelers finding their way in the fog, which often prevails between Olinda and the summit. From the summit there are two very rough and steep trails leading down into the crater and along its floor to the Kaupo Gap, and thence down to Kaupo.

A favorite trip, for both island people and tourists, unsurpassed anywhere for the grandeur of its scenery, is from Wailuku through Paia and to the summit of Haleakala, where the night is usually spent, then down through the crater, and out through the Kaupo Gap down to Kaupo, from there to Kipahulu and Hana, over steep zigzag trails that were built over a hundred years ago, under the direction of the ancient Hawaiian chiefs, then on through the beautiful tropical forests and immense gorges and rushing streams of the windward side of the island, through Nahiku, Keanae and Huelo, to Paia, thence by train back to Wailuku.

There has also been completed this year, partly by the Territory and partly by the County, a road up the celebrated Iao Valley, about 3 miles in length, which leads to the table land in the valley long famous for its beautiful scenery. This table land is but an hour's ride from the center of Wailuku, and most of the distance can now be made by carriage. Many people walk from the end of the carriage road to the top of the table land, which is less than one mile from the end of the wagon road.

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

Division of Entomology.

REPORT OF SUPERINTENDENT OF ENTOMOLOGY FOR SEPTEMBER, 1908.

Honolulu, Hawaii, October 1, 1908.

Hon. Board of Commissioners of
Agriculture and Forestry
of the Territory of Hawaii.

Gentlemen:—I beg to present herewith the report of the Entomological Division for the month of September.

INSPECTION.

We boarded 24 vessels for the purpose of inspection and found 17 of them to have brought more or less matter subject to our inspection.

TABLE OF INSPECTION.

NO. OF		DISPOSAL AND CAUSES.
LOTS.	PARCELS	
769	13,163	Passed as free from possible pests.
22	183	Fumigated, with the exception of a few cases, to kill greedy scale on fruit.
4	22	Destroyed. Largely dirty and maggoty turnips.
3	394	Ordered returned owing to excessive infestation with greedy scale.
798	13,762	Total inspected.

Hilo Inspection.

Upon his inspection work at Hilo, Bro. Matthias Newell reports as follows:

"2245 parcels passed the inspection during the month of September. All were in good condition, excepting two cases of pears, having arrived in bad condition, were dumped."

POSSIBLE PESTS INTERCEPTED AND DESTROYED.

GREEDY SCALE.

A large number of the apples and lemons coming from California during the month were found infested with greedy scale (*Aspidiotus rapax*) and it was found necessary to return or fumigate those found excessively infested. The insect is already a formidable pest in the Territory, especially to native trees in some districts and to augment it by the admission of hordes on fruit is not desirable. Herewith I beg to exhibit two apples taken out of the same box, one before, the other after fumigation. Both are infested with greedy scale at the calyx; while the former shows a vast number of young bugs hatched since importation, the latter bears only the few original adults, beautifully demonstrating the effectiveness of fumigation.

YAMS FROM ORIENT.

The yams brought by the "Korea" from the Orient on the 20th were found infested with numerous colonies of our common ant (*Pheidole negacephala*) and a variety of other insects, for which they were fumigated before being released. Some of the yams were found affected with a fungus at the extremities and Mr. Lewton-Brain, to whom specimens were submitted, reported that it was of a parasitic nature. The importers of these roots were therefore notified thru their brokers that henceforth yams found so infested will be destroyed. Glad to report that such action was not found necessary with yams that arrived subsequently.

PINEAPPLE PLANTS.

Two pineapple plants were received per mail from Florida. They were fumigated and dipped in Bordeaux and as a further precaution submitted to a plant pathologist for examination. He reported finding no disease but counseled retaining the plants in quarantine under observation until maturity in order to enable us to destroy them should a disease, now within, make its appearance externally before then. They were turned over to the Nurseryman for confinement, the government nursery being the best place we could think of available for the purpose.

Should additional importations require quarantine, as would appear likely from a telephone message received from a citizen desirous of importing new pineapple varieties, it may become necessary and desirable to seek the coöperation of the U. S. Experiment Station for this work, since that station is already equipped with ample grounds and expert oversight.

PUBLICATIONS.

The regulations pertaining to the inspection of bees and honey imported into the Territory, passed by the Board on September 2nd, and approved by the Governor on September 17th, were published as a By Authority in the Advertiser on the 26th. The law and regulations bearing on the subject were prepared as General Circular No. 3, and placed in the printer's hands. 500 copies are to be printed and given wide circulation, especially among bee keepers of the Territory.

Recpectfully submitted,

JACOB KOTINSKY,
Superintendent.

Division of Animal Industry.

REPORT OF THE ASSISTANT VETERINARIAN.

(Read at Board Meeting on Oct. 21st, 1908.)

Board of Commissioners of
Agriculture and Forestry,
Honolulu.

Gentlemen:—I herewith submit the report of the work of this division since the last meeting.

The work has been mostly inspection of importations. The "Lurline" arrived with 52 mules and one horse on board. Twenty-four mules were consigned to the Schuman Carriage Co. and were immediately quarantined in the Schuman paddock. The rest of the shipment were for Hilo.

I considered those going to Hilo as very suspicious, there having been five rejected on test from the same herd and advised Dr. Elliot of the same. Considering the fact that there is no quarantine station at Hilo, I only allowed them to pass here upon the guarantee of the man in charge to carry out Dr. Elliot's plans for isolation, whatever they might be.

The "Virginian" arrived here from Seattle with two stallions on board for A. W. Carter, which horses were to be used for breeding purposes. They had come through with no certificate of health and were immediately quarantined at Mr. Waterhouse's stables on Judd street and tested the second day following. The result of the test proved them to be free from glanders and so they were allowed to proceed to their final destination.

The remaining live stock consisted of chickens and turkeys, all of which passed, showing no infection of any kind.

Twice a week I have examined the horse in the Japanese stable at Iwilei and so far find no suspicious symptoms.

I expect to receive the mallein ordered within the next three weeks and so will be able to test them. Evidence sufficient to incriminate Damura, who was treating this case of glanders, has been collected and placed in the hands of the Attorney General. Action has been taken against him, he being find $50.

On September 24th Dr. Rowat reported another case to me which was taken to the quarantine station at once and killed. Dr. Rowat reported it as glanders and farcy. The animal, a mule, was in a very advanced stage and hardly able to stand. It was discharging through both nostrils and the lymphatics of the head were corded and ulcerated. I prepared several slides from the pus of these small abscesses, the microscopical examination of which showed the presence of cryptococci of epizootic lymphagitis.

On September 22d Mr. Myhre, the milk and dairy inspector, reported to me a case of a cow which seemed not to be in good health. The cow was located in a Japanese dairy on School street, the man having obtained same from a Portuguese and now that I had appeared he was very anxious to get rid of it.

The animal was very much emaciated. I applied the tuberculin test, but obtained no reaction and also examined the feces for embryos of liver flukes. The embryos while quite numerous seemed to me insufficient to produce such a degree of emaciation. Mr. Myhre was somewhat inclined to believe it a case of starvation and we are now watching the animal which is now in the possession of the owner and under different conditions. If it does not improve after sufficient time has elapsed it will be killed and post mortem made to try to discover the cause of its condition.

On October 15th and 16th I examined and tested a mare belonging to McQueen and found her free from any infection. At that time McQueen told me of a horse he had seen which seemed to him suspicious. It belonged to a Japanese who had been drawing stone from Kaimuki. I was unable to go at that time but went on the afternoon of the 16th and located the place on School street and found that the horse had died an hour or two before and had been taken to Kalihi. I have lost all track of him. On inquiry I found that Damura had been called in consultation several days before the animal died. And after an hour's work I found this Damura and from him obtained a knowledge of the symptoms, all of which pointed toward glanders. There was no other horse stock on the place.

Late in the afternoon on October 16th I was called up by Dr. Monsarrat, who had located a case of glanders on Beretania Avenue. I went at once and found the animal along side the road and hitched to a lumber wagon, a Chinaman in charge. The man could speak little English and I was unable to get any information so there was nothing to do but tell him to go home and I would follow, which I did. He finally came to a stop at He. U.

Ying & Co., they being dealers in cord wood and I found that the head man there obtained the horse from a Jap who lives in Palama and he did not wish to give up the horse until the owner was present.

I had to send a man to find the Jap and ascertained that he was at Waipahu. I told the man in charge to keep the horse there until 9 o'clock the next day and not to use it, all of which he promised.

The next morning I got there at 8:30 and found the horse gone and that Mr. Pottie had been called in consultation. I waited no longer, but took the fellow along with me and found the horse in a pasture and took him to the quarantine station.

On Saturday, October 17th, when returning from Kalihi I passed a dray standing opposite a blacksmith's shop, the single animal hitched to it having a profuse nasal discharge. I stopped and examined the animal and found it to be suffering from glanders. I crossed into the shop and found the other animal in the same condition.

I had the driver hitch up at once and go to his stable which he said contained three other animals. Upon arrival there I found only one, the others being at work. I examined this animal and found no suspicious symptoms and told him to have the others there when I came Monday morning.

While there I went over to a Japanese hack stable next door and found a well developed case of glanders. While I was talking with some of the men there to get the name of the owner I observed a Japanese woman go up to this horse and wipe out its nostrils and throw the rag over her shoulder. She also carried a child on her back. I had her burn this rag at once. They displayed absolute ignorance of the character and dangerousness of the disease. I removed all three animals to the quarantine station.

On Monday, October 19th, I killed and tested the animal found on Beretania Avenue. I have a very good specimen showing several ulcers about the size of a quarter on the nasal septum which had eaten almost through. The lungs were filled with small nodules. The remaining horses are still at the quarantine station, the owners having put the matter in the hands of Attorney Magoon. The animals are now being tested by Dr. Rowat according to their request, the test being under my supervision and the report being given to me for my approval.

The stables where the animals were I am having disinfected by Mr. Lawrence of the Board of Health, and I am watching the remaining animals.

I have received some of the supplies which I ordered from the laboratory, but they are not complete. It will probably be another month yet before I am able to do much in bacteriology. I have now started the work in pathology. The equipment, while not being complete, is sufficient for me to commence the work.

As regards the quarantine station at Hilo things are still in an

unsettled state. The land owned by the Volcano Stables upon closer examination is not showing up as well as expected. We hope before long to hear of Dr. Elliot finding a suitable place.

Very respectfully,

L. N. CASE,

Assistant Territorial Veterinarian.

Some months ago, the FORESTER called attention to the prevalence of the yellow parasitic vine which the natives sometimes use for making hat *leis*. The habit of this convolvulus brings about the destruction of its host so that its appearance should always be viewed with suspicion and its destruction brought about. Unfortunately the propagation of the plant is greatly assisted artificially by the practice of establishing it in convenient locations so that it may be available for *lei* making. In this way the plant is becoming very wide spread, and there is great fear that unless measures are taken to check its growth, it will become one of our most noxious weed pests. Those who are familiar with the devastation wrought by 'dodder' in European countries will appreciate the desirability of ridding agricultural districts of a like pest. It is to be hoped that its harmful nature will be explained to those who are thoughtlessly transplanting the vine alluded to, in order that its wider distribution may be checked.

NEW FARMERS' BULLETINS.

The following Bulletins may be obtained free from the Secretary of Agriculture, Washington, D. C.:

Silver Fox Farming. By Wilfred H. Osgood, Assistant, Biological Survey. Pp. 24, figs. 10. (Farmers' Bulletin 328.)

This bulletin describes the silver and silver-black fox, areas suitable for fox farming, breeding, preparation of the skin, etc., and contains information as to methods of fox farming, causes of failure, expenses, and profits.

Experiment Station Work, XLVII. Compiled from the Publications of the Agricultural Experiment Stations. Pp. 32, figs. 4. (Farmers' Bulletin 329.)

Contents: Low grade *v.* high-grade fertilizers—Improvement of sandy soils—Dry farming—Seed selection—Evergreens: Uses and culture—Nut growing in Maryland—"Hogging off" corn—Mineral matter in feeding stuffs—Preparation of miscible oils—An automatic cheese press—Cane sugar and beet sugar.

Forage Crops for Hogs. By C. E. Quinn, Scientific Assistant, Farm Management Investigations, Bureau of Plant Industry. Pp. 24. (Farmers' Bulletin 331.)

This bulletin treats of the pasturing capacity of alfalfa, wheat, oats, rye, and a number of less important forage crops, the systems of feeding and pasturing hogs practiced in Kansas and Oklahoma, and contains a table showing suitable pasture crops for the different seasons with the number of hogs per acre.

NEW PUBLICATIONS.

FRUIT MARKETING.

Fruit Marketing Investigations in 1907, by J. E. Higgins, Horticulturist, Hawaii Experiment Station, U. S. Department of Agriculture.

The above publication contains in a brief space much valuable information to the fruit grower in this Territory, where the shipment of choice table fruit to the Coast is rapidly becoming one of the most important industries. The development of the export pineapple trade during the last few years has been enormous and there are now nearly three thousand acres of land throughout the islands devoted to successful pineapple cultivation.

The success of this fruit only foreshadows the future development awaiting the mango, papaia and avocado industries, and indications are already present which show that within a comparatively short time, the total output of fresh fruit from this Territory will rank the islands among the important fruit-producing countries of the world.

To ascertain the best methods of marketing our rapidly increasing fruit crops is quite as important to the success of the industry as an enquiry into cultural methods. To determine some of the most important factors in marketing Hawaiian fruits, the Hawaii Experiment Station has conducted a series of actual experiments in shipments, now covering a period of about four years. The present bulletin contains the results of experiments in 1907 so far as they are of immediate practical application.

During the summer a consignment of about twelve tons of pineapples, and supplies also of avocados and papaias were shipped to San Francisco under the personal care of Mr. Higgins. An account of the condition of this fruit upon arrival at various market centers as far east as Chicago is given in the Bulletin referred to. Special and exact information is also furnished as to transportation rates upon our fruits to various points of destination, the manner of packing refrigeration cars, and many other matters.

A particularly useful feature of the Bulletin is the chapter devoted to the organization of growers and shippers into a coöperative marketing concern. The markets that may be reached by Hawaiian shippers, and their capacity of supply also receive consideration, together with the prospective competition which must be reckoned with.

Altogether Mr. Higgins has gotten together a mass of information which marks his Bulletin as one of the most valuable and practical papers which have been compiled on this subject.

'Fruit Marketing Investigation in 1907' comprises Press Bulletin No. 21 of the Hawaii Agricultural Experiment Station, Honolulu.

HAWAIIAN RUBBER.

The Ceara Rubber Tree in Hawaii, by Jared G. Smith, Special Agent in Charge of the Hawaii Experiment Station, and Q. Q. Bradford, Assistant in Rubber Investigations.

The above publication commences with a succinct account of the habit of growth and root and latex systems of the Ceara rubber tree and furnishes full cultural directions for the establishment of a plantation.

An interesting account of various systems of tapping is then given and of the methods of coagulating the latex and preparing the rubber for market.

To the Hawaiian agriculturist probably the most important part of the work will be found in that devoted to the actual tapping experiments on Kauai, where as is well known two groves of Ceara rubber trees were discovered in 1906, one at Lihue and another at Koloa.

Tapping experiments were begun at Lihue in January, 1907, these being fully described in the publication. So far as operations have been undertaken to determine the latex yield of rubber trees in the islands (upon Kauai, Oahu and Hawaii) a very wide variation of results is noticed, and it is essential that this question be investigated with a view to establishing a system of securing a uniform and satisfactory yield.

The chapter devoted to the outlook for rubber contains much to encourage the belief that this crop is likely to well repay investment when plantations are conducted under proper climatic conditions.

"The Ceara Rubber Tree," in Hawaii is Bulletin No. 16 of the Hawaii Agricultural Experiment Station.

HAWAIIAN HONEY.

Hawaiian Honeys, by D. L. Van Dine, Entomologist, and Alice R. Thompson, Assistant Chemist, Hawaii Agricultural Experiment Station.

The report that Hawaiian honey was not favorably received in the mainland and the London markets, caused the Hawaii Experiment Station in 1905 to commence a detailed study of the source and characteristics of our local honeys. The investigations show that although Hawaiian honey sometimes departs materially from the official definition of honey, this fact is to be attributed not to adulteration, but to sources or characters till now little understood.

The importance of the information derived from recent investigations, and its bearing on the marketing of Hawaiian honey, have rendered it advisable to make this the subject of the Bulletin in question rather than reserve it for a larger work on Hawaiian apiculture.

Hawaiian honey consists of two distinct types, viz.: the usual floral product and an abnormal honey dew product. Between these two types every variety is noticed dependent upon the abundance or scarcity of flowers.

The Hawaiian floral honey is derived chiefly from algaroba flowers, but also from lantana, guava, rice, ilima, ohia and various other trees and plants.

The honey-dew product comes mainly from a viscid saccharine secretion of the sugar cane leaf hopper and sugar cane aphis, deposited on the leaves of the sugar cane.

The algaroba honey is almost white, while the honey-dew product is very dark. Intermediate honeys of all colors occur. The honey-dew product, although departing radically from established conceptions of honey, is stored by the honey-bee, and as such is unadulterated.

For table use, color and aroma of honey are all important, but for baking and confectionery these qualities are of less importance. One local company reports that it has received from one-half cent to one cent more per pound for its honey-dew crop than its algaroba product.

"Hawaiian Honeys" comprise Bulletin No. 17 of the Hawaii Agricultural Experiment Station.

BY AUTHORITY.

SPECIAL WARNING NOTICE.

FIRES TO CLEAR LAND—MOLOKAI.

Notice is hereby given that in accordance with Section 6 of Act 71 of the Session Laws of 1905, it is forbidden to start fires for the burning of brush, dry grass, etc., for a period of three (3) months from October 1st, 1908, unless the written permission of the District Fire Warden has first been obtained, on the Island of Molokai, excepting that portion between the lands of Pukoo and Halawa, inclusive.

The law reads: "Such fires shall not be started during a heavy wind or without sufficient help present to control the same, and the fire shall be watched by the person setting the same, or by competent agents of his, until put out." The District Fire Warden is Mr. James Munro of Kaunakakai.

RALPH S. HOSMER,
Superintendent of Forestry and Chief Fire Warden.

Honolulu, T. H., September 28, 1908.

INSECTS IN THEIR RELATION TO AGRICULTURE.

BY D. L. VAN DINE.

(Lecture II, Feb. 28th, 1908.)

This is the second of two lectures delivered by Mr. Van Dine and illustrated by lantern slides, before the students of the College of Agriculture and Mechanic Arts of Hawaii.

In my first lecture I trust I left with you an impression that insects are, as a class, wonderfully specialized and meeting their necessities for life and growth with marvelous adaptations. Such an impression will be an incentive to take up their study. You have formed, probably, a more definite idea of what an insect is. We distinguish birds from fishes for the reason that we know them, we are familiar with them and in the same way we can become familiar with insects and distinguish them from other members of the animal kingdom. You can be told that a spider is not an insect and you could remember and be able to repeat, if asked, that a spider is not an insect but a near relative. The better way is to determine in your own mind by observation and by the aid of books, just what an insect is. You will then know without being told, that a spider is not an insect. Do not, however, allow the fact that insects do possess certain common physiological characters, separating them zoölogically from other animals, blind you to the more important fact that they are in their life and habits intimately related to and dependent for their very existence on both the plant and animal world that surrounds them.

Insects in their relation to man have been classified as follows:
Insects are injurious:
  As destroyers of crops and other valuable plant life.
  As destroyers of stored foods, dwellings, clothes, books, etc.
  As injuring live stock and other useful animals.
  As annoying man.
  As carriers of disease.
Insects are beneficial:
  As destroyers of injurious insects.
  As destroyers of noxious plants.
  As pollenizers of plants.
  As scavengers.
  As makers of soil.
  As food (both for man, for poultry, song birds, and food fishes) and as clothing, and as used in the arts.

Insects in feeding upon plant life are simply fulfilling their part in the subjection of the plant world. They may be injurious or they may not, in accordance with the value to man of the plant

fed upon. The Japanese beetle in feeding upon roses, grapes and other useful plants becomes an injurious insect, but the lantana-feeding insects are beneficial for the reason that the lantana is a noxious plant. The silk-worm feeds upon a useful plant, the mulberry, and if the silk-worm was not a domesticated insect and did not produce the silk of commerce, it would be an injurious insect. It is a plant-feeding insect, yet it is a useful insect in that it produces something of value to man. It is man's interest entirely that decides whether or not an insect is injurious or beneficial.

Let us consider why a plant-feeding insect can work greater destruction to a cultivated plant than it can to a plant in the state of nature. We have said that in a state of nature a balance is maintained. The ravages of insects among cultivated plants would indicate that this balance is not maintained under conditions of cultivation and yet it would seem that a cultivated plant had a great advantage. With cultivated plants there is no struggle for occupation of the soil. The soil is broken up and put in a condition favoring germination and growth. Water is given if dryness threatens. Fertilizers are added for food. It would seem that of all plants, those under cultivation are best fitted to survive, that is, grow and produce fruit. Wherein, then, is the disadvantage? All plants have their insect enemies and always have had. By providing for the growth of one plant to the exclusion of all others, abundant provision is made for the food of the insect enemies of the plant. The conditions have been made favorable for the growth of the plant, also, equally favorable for the increase of its insect enemies. One of the fundamental principles of life is that a particular kind or species shall not predominate to the exclusion of all others and the appearance of weeds in a cultivated area and the onslaught of insect enemies is but a natural consequence of man's interference with natural conditions. Another fundamental factor that gives the insect enemies the advantage is the fact that hardiness and resistance in a wild plant is sacrificed for quality in a cultivated plant. The man who can raise a crop without an effort to prevent insect injury is the exception. Insect injury was called a visitation of God in the dark days. Now it is recognized as a natural outcome of cultivation. Every plant has its insect enemies and the suppression of these enemies is just as distinctly an agricultural operation as plowing, planting, cultivating or harvesting.

We had illustrations in the last lecture of the development of an insect, that is, the egg, the larva, the pupa, and the adult. The young, or larval stage of development, is one of growth and it is during this period, naturally, that the greater amount of food is required. As a group the caterpillars of moths and butterflies do an immense amount of damage to plant life. We do not always recognize the crawling caterpillar that feeds upon our plants as the young of some well-known moth or butterfly. We

must, then, become familiar not only with the adult insects but study their life-history and habits.

We have spoken of the mouth-parts of insects. Knowledge of the manner in which insects feed will enable us to determine by the injury to the plant the insect responsible for the damage whether biting or sucking, and the nature of the remedy to be applied.

Time will not permit a discussion of particular insects or details as to remedies. We are dealing with the subject in a general way. Insect suppression or control may be classified as follows: Direct measures, including the use of insecticides, or any measure that actually by mechanical means reduces the numbers of the insect; and the preventive measures, including cultural methods, natural enemies, quarantine and sanitation.

In direct efforts of control dependence is placed in the main upon insecticides, that is, insect killing substances. Insecticides may be classed under two general heads, namely, substances for killing biting insects, and substances for killing sucking insects. The insecticides used for biting insects are termed "stomach poisons." Those used against sucking insects consist of "contact poisons," "external irritants" and "poisonous gases."

Insects that bite off and swallow the portions of plants upon which they feed would likewise take into their systems any poison that might be placed upon the surface. Therefore, in combating an insect belonging to this class, that is, those actually chewing or gnawing into the foliage, the idea is to cover the surface with a poison, harmless to the plant, but sufficient in strength to kill the insect when taken into the stomach. The insect killing substance, or insecticide as it is called, is applied evenly over the surface in the form of a fine spray or powder by various machines made expressly for the purpose. The arsenical poisons are the common remedy for the biting insects and among the various compounds, Paris green has been the standard one. Paris green is usually applied in milk of lime. The lime in the mixture has the property of off-setting the burning qualities of the Paris green. In low grade Paris green there is a large excess of free or water soluble arsenious oxide which will have a direct injurious effect on the foliage of the plant and give it the appearance of having been burned. The Paris green to be harmless to the plant should be practically insoluble in water. The finely divided crystals are only in suspension in the spraying mixture and for this reason, constant agitation of the liquid is necessary during the process of spraying. These crystals, though insoluble in water, are soluble in the digestive juices of the intestines of the insect and thus death is brought about by an absorption of the poison. One of the more recent arsenical poisons is seemingly better suited to the Hawaiian conditions than Paris green. This compound is an arsenate of lead. Paris green, as has been said, is quite likely to burn the foliage, especially if it is of low grade or is not used with lime;

it is easily washed away by showers and being not easily seen when used alone, is difficult to apply evenly over the surface of the plant. On the other hand, the arsenate of lead is entirely insoluble in water, thus obviating any danger of burning the foliage; it is white in color, thus insuring an even coating over the plant, and is quite adhesive, not being easily washed away by showers. These properties of the arsenate of lead in the freshly prepared wet form make it preferable to the less adhesive, though more active Paris green. The arsenate of lead is now in the market in paste form, ready for immediate use. Such preparations are for sale in Honolulu.

Since those insects feeding upon the juices and sap of plants do not swallow portions of the plant itself but gain their food by inserting the beak or proboscis through the epidermal layers into the tissues, it is to be seen that they would not be affected by a poison placed on the surface. Therefore, in fighting the insects belonging to this second class, other methods must be employed. The methods are to kill the pests by applying to their bodies an external irritant or contact poison, and by submitting them to the fumes of some deadly gas or fumigation. In the case of the external irritants applied as a spray or powder, the entire body of the insect must be covered and every infested portion of the plant treated to have the work effective. The oil sprays or washes are the most important remedy for sucking insects and the standard one has been the kerosene emulsion. The resin wash is not suited to the Hawaiian conditions because of the fact that this wash acts principally as a covering to the insect and kills by smothering the pest. Resin wash has been used with success against certain scale insects in California during the rainless season. With the frequent rains here and the necessarily greater length of time for the resin wash to act in comparison to the oil washes, the more active kerosene emulsion should be used.

Insecticides are applied to plants in liquid form or as a powder in dust form. The most common method is a liquid in the form of a spray. There are many manufacturers who make pumps and spraying accessories expressly for this purpose. The apparatus ranges all the way from a hand syringe with a capacity of a few ounces to a steam or gasoline outfit holding several barrels. The important parts of any spraying device are the pump to force the liquid out through a hose and a nozzle at the end of the hose to convert the liquid into a spray. Where the plants are any height, trees for example, the spray must be brought in close proximity to the parts of the plant to be treated, since a spray will not carry any distance. This is done by means of an extension rod.

Successful spraying depends mainly upon five things: (1) Understanding the feeding habits of the insect pest, that is, whether it is a biting or a sucking insect; (2) the nature of the remedy to be applied; (3) the proper preparation of the spraying

mixture; (4) the efficiency of the spraying apparatus; and (5) the thoroughness with which the work is done. The frequency of showers will at certain times and in certain localities in Hawaii make spraying more difficult than elsewhere.

In temperate climates much of the spraying is done during the winter at the time when the plants are not in leaf and then there is much less danger of damage to the plant. Since plants are continuously in leaf in Hawaii weaker mixtures must be used and a more persistent effort must be made to keep the plant feeding pests in check.

Preventive measures are the keynote in insect warfare. It is easier to prevent an insect pest becoming established than to suppress them by curative measures afterwards. Thorough cultivation, selection of resistant varieties, the time of planting, supplying necessary plant food by fertilizers, the introduction of natural enemies, entomological quarantine, spraying before the pests become epidemic, are all measures that will tend to restore the "balance" in favor of the plant.

It is a fact accepted by economic entomologists without exception, that a healthy plant can resist to a great degree the attack of an insect enemy. To bring about a healthy growth and promote vigor, we must see that our plants receive a sufficient supply of water and plant food. Also in the various cultural practices we must consider their direct effect on the insect pests; that is, to control an insect pest by cultural methods, implies more than the practice suitable for the plant itself. For example, in tillage it may be that as far as the plant requirements are concerned, only the surface of the soil need be kept in a friable condition, but I think it well to stir the soil frequently about fruit trees to a considerable depth to break up the chambers of the ant nests about the roots since these insects are very active in the distribution of the scale insects. For the same reason it would be well to flood the area occasionally about the trees for a period of several hours. In pruning, furthermore, the purpose of the trees may not require leaving the center open so that a free access of light and air is possible, but just this condition is unfavorable to the development of scales and mealy-bugs, and should be practiced. Also such a method of pruning makes thorough spraying possible. Enough has been said to show that cultural methods can be made an important factor in insect control.

I have seen owners spraying for the Avocado Mealy-bug and allowing wild guava to grow about the place simply covered with the same insect. Obviously the guava should have been eradicated. If Hawaii is to become a fruit-producing country, it must of necessity learn the lesson of putting on the market not alone fruit, but clean fruit. All manner of places that will harbor insect pests must be done away with. Many plants of no economic importance are included in the list of food plants of many of the insect pests. What good to fight the pests on the cultivated plants

and leave infested wild plants to breed new generations? Rubbish piles must be burned, and fallen fruits and culls and infested stalks and vines destroyed. After harvesting a crop, the field should be as clean as it is possible to make it. This preventive work pays.

The first three methods of insect control, namely, direct measures, cultural methods and sanitation are of the most importance to the farmer himself, since they are methods actually within his power to use at a time when his crops are menaced by injurious insects. Two important preventive measures remain, namely, natural enemies and quarantine. It may be that the time will come when farm sanitation, natural enemies and quarantine will obviate the necessity of direct measures. Certain it is, that far-reaching results have been obtained through these methods of insect warfare, but the use of direct measures on the part of the farmer or planter is still a necessity. Results from the last named methods must be obtained before we can do away with the former. All insect pests have, naturally, as has been stated, many enemies, and in some localities, notably in the United States and Hawaii, many additional ones have been introduced. With these insect friends the farmer must become acquainted, and their propagation and dissemination be encouraged.

Until very recent times the development of a country agriculturally, has implied that with the introduction of desirable economic plants should come also their many and various insect enemies, and that, as the commercial relations of the country became intimate with other countries, such injurious species would continue to be introduced. Although many of the injurious species of insects, particularly the class that includes the scale insects, mealy-bugs, etc., are world-wide in their distribution, there are many that are peculiar to the country in which they occur. It remains then for a community alive to its own interests to take the necessary precautions that shall prevent the introduction of these pests. Hawaii to her great credit, supports entomological quarantine work.

MISCELLANEOUS FORESTRY NOTES.

MARINE BORERS.

Marine wood borers, which attack piling and other timbers placed in salt water, are causing the engineers in charge of the construction of marine works on the Pacific Coast much concern. They are particularly destructive along the coast from Southern California to Alaska, and shippers are beginning to realize that a cheap preservative treatment for this class of material would secure a big saving. On the average, an untreated pile lasts in these waters not more than three years.

A great deal of time and money has been spent by individuals and corporations in the effort to prolong the life of these timbers. Different styles of pile casings, made of copper, zinc, cement, and other materials, have been constructed and patented, and at the present time piles thus encased are under observation in many localities.

In addition, a great deal of work has been done in developing a preservative treatment to prevent the attack of the borers. This consists in impregnating the pile with creosote or dead oil of coal tar. When the piles are open-grained, and the oil has been of a proper quality and has been correctly injected, this plan has probably given the best results. It is true that a great many piles treated with creosote have been attacked by marine borers and destroyed, but in such cases there is usually a good reason to account for the failure. For instance, the use of timber of such density that the preservative cannot be forced into it, the use of green timber, the lack of sufficient preservative, or the use of a preservative of inferior grade may prevent the treatment from being completely successful.

BETTER LUMBERING METHODS.

The criminal wastefulness of the old time lumberman has left bare scars in practically every section of the United States, where after the land had been denuded of trees, the fire has swept. Great as was the waste in the woods the waste at the mill was almost as serious. In many cases considerably less than half the available tree was marketed.

Practical men in the lumber industry are now reducing waste to a minimum. Improved machinery is playing its part in the utilization of the tree, and better work in the woods and protection from fire are already doing much to ameliorate the threatened lumber famine.

The day when the lumberer slashed trees ruthlessly and boasted of the inexhaustible timber resources of the United States have forever passed away.

SAW DUST.

So great is the importance of checking timber waste that the National Conservation Commission is instituting a special investigation as to the waste of lumber in saw mills. In this connection cooperage, veneer, furniture, box, vehicle and implement manufacturers are being asked to point out the sources of waste in their respective callings.

THE HAWAIIAN FORESTER AND AGRICULTURIST

VOL. V NOVEMBER, 1908 No. 11

We are fortunate in being able to present in this number the report of Mr. Fred. T. P. Waterhouse on the cultivation of rubber, written as a result of his recent visit to Ceylon and to the Malay States in the interest of the rubber growers of Hawaii and of the Commissioners of Agriculture and Forestry.

Since the first commercial planting of Ceara rubber trees in the Hawaiian Islands, now some eight years ago, the general lack of information as to the proper system of planting and process of collecting the latex, directed the attention of Hawaiian growers to Ceylon and the East Indies, where the cultivation of rubber producing trees had been carried on for many years upon an extensive and profitable scale. As the industry in this Territory increased and the earlier plantations developed towards a producing stage, the necessity for more accurate information upon many important questions affecting the production of rubber in all its stages, became more and more urgent. At this time, Mr. Fred T. P. Waterhouse, who was already about to undertake a visit to the Malay Peninsula to investigate the rubber industry there, was commissioned by the Board of Agriculture and Forestry of Hawaii to extend his itinerary with a view to procure sufficient information to assist Hawaiian planters generally. The result of Mr. Waterhouse's investigations are published in full in this number.

Hitherto the bulk of the world's rubber has been derived from uncultivated trees, but the extraordinary development of the economic uses of rubber and the depletion of the world's natural supplies, has in the last few years called into existence in nearly all countries whose climatic conditions are favorable, extensive plantings of rubber producing plants. In the future, the demand for rubber must more and more be met by the cultivated product, and the forest supplies must eventually cease or become negligible.

Although the cultivation of rubber has already been engaged in profitably for some years, it is a remarkable fact that many of the most important factors to the success of the industry are yet little understood, and the relative value of many processes of operation are yet undetermined. As regards such essential operations as the most profitable number of trees to the acre to plant, the method and frequency of tapping, the collection and manipula-

tion of the latex, a great diversity of opinion exists. Before the industry is established upon a satisfactory basis it is necessary that most of these debatable questions be determined. In the meantime, however, the rubber growers of Hawaii are to be congratulated upon having presented to them by Mr. Waterhouse an epitome of the most approved methods of cultivation and manufacture obtaining in those countries which have been dealing with these problems longest, and which have been most successful in the production of commercial rubber. As the writer remarks, however, we must very largely work out our own methods and learn for ourselves how best to meet our own problems, for it is certain that Hawaiian conditions will present difficulties and peculiarities for whose control special methods will be required.

The recent visit to the Hawaiian Islands of Mr. F. H. Newell, Director of the United States Reclamation Service, has again directed our attention to subjects of vast importance to the agricultural future of this Territory. In the addresses delivered by Mr. Newell before various committees and scientific wrokers, much valuable information has been acquired and many practical suggestions have been made which will materially assist in blocking out in broad lines the general reclamation work which should be undertaken in these islands in future years.

IRON IN HAWAIIAN SOILS.

Through lack of space, we are unable to include in this number an important contribution by Mr. W. P. Kelley, chemist at the Hawaii Agricultural Experiment Station, entitled "Magnetic Oxide of Iron in Hawaiian Soils." This paper will be included in the December number.

ENTOMOLOGICAL SOCIETY'S PROCEEDINGS.

The Forester is in receipt of Volume II, No. 1, of the Proceedings of the Hawaiian Entomological Society, which will be noticed at greater length next month. The publications of this society are with each number becoming of greater importance, both from a general and also a scientific standpoint. The present number is a particularly valuable one. It contains, among other papers, a most interesting account by Mr. Swezey of the life history of *Chaetogaedia monticola*, which presents much original information upon a subject till now little understood. The article by Mr. Kotinsky upon *Orthezia insignis*, describes very clearly the present status of this pest, which is attacking Lantana in the Hawaiian Islands, and threatening other plants of economic importance.

REPORT ON THE CULTIVATION OF RUBBER IN CEYLON AND THE FEDERATED MALAY STATES AND JOHORE.

BY FRED T. P. WATERHOUSE.

To the Board of Agriculture and Forestry,
and Hawaiian Rubber Growers' Association,
Territory of Hawaii.

Gentlemen:—I beg to submit the following report concerning my recent trip to Ceylon and the Malay Peninsula for the purpose of investigating and reporting upon the status of the Rubber Industry in those countries and the methods of planting, cultivation, tapping and treatment of rubber, in use there, with a view to giving the people of Hawaii information upon the said subjects.

The status of the Rubber Industry in Hawaii and the conditions under which I made this trip are as follows:

Ficus Elastica has for many years been a garden tree in Hawaii, but no attempt to make practical use of the same, has ever been made.

Some twelve or fourteen years ago the then Commissioner of Agriculture of the Republic of Hawaii, introduced and disseminated through the Islands a number of seeds of the Ceara Rubber tree. No especial notice was taken of the results until about five years ago when a tree, then seven or eight years of age, at Nahiku, Maui, was tapped and was found to yield an apparently good commercial article of rubber.

Upon further investigation a number of vigorous, healthy Ceara rubber trees were found to be growing in the various districts of the Islands.

Upon the showing made several companies for the cultivation of rubber were formed and a considerable number of trees planted.

In the month of December, 1907, there were growing in the District of Koolau, Island of Maui, approximately twelve hundred acres of Ceara rubber trees and a very few trees of the Hevea and Castiloa varieties.

In view of the possibilities of the rubber industry in this Territory; of the fact that Ceylon and the Malay Peninsula have engaged in the cultivation of rubber on a larger scale than any other part of the world and of the further fact that in Ceylon Ceara rubber had been profitably cultivated it was deemed advisable by some of the rubber growers of Hawaii, and by the Board of Agriculture and Forestry to send someone to that section of the world to make observations as to means and methods used there in connection with the industry, and to report thereon for the benefit of the industry and the public in Hawaii.

With this object in view it was decided, that as I was about to visit the Malay Peninsula in the interest of the firm I am connected with, that I should extend my proposed trip, the expenses being partially paid by those interested in the rubber industry in Hawaii and by the Board of Agriculture and Forestry.

In accordance with this purpose I was duly commissioned by the Board of Agriculture and Forestry, and left Honolulu on the 15th day of November, 1907, arriving at Singapore on the 16th day of December following.

From my arrival at Singapore until the 18th day of January I visited many of the principal rubber plantations in the Federated Malay States. Arriving at Colombo, Ceylon, on January 22nd, I spent ten days visiting plantations, sailing for Java on the 1st of February. Eight days were spent in Java and I arrived again at Singapore Sunday, February 23rd.

From then on to the time of my departure, February 29th, I spent on the plantations in the Province of Johore.

I am indebted to Dr. Willis, Director of the Royal Botanical Gardens at Peradeniya; Mr. Fox, Acting Director of the Singapore Botanical Gardens; Mr. Pit, at the Botanical Gardens at Buitenzorg, Java, and the different plantation managers and government officials that it was my pleasure to meet, for valuable information and courtesies.

The cultivation of rubber trees is being extensively carried on in Ceylon, the Federated Malay States, Borneo and Java. In these countries greater advance has been made in rubber cultivation than in any other part of the world. Virgin forests are being felled, cleared, replanted with rubber trees, and brought into bearing at a cost of from $100 to $150 (U. S. gold) per acre while commercial rubber is produced and placed on the London market at a cost of from 24 cents to 36 cents per pound including capital cost. The tapping of rubber trees and the method of collecting and handling the latex from the trees in a systematic and econom-

Cost of Production.

ical way is only in its infancy. As time goes on and large areas of trees come into bearing and with the experience gained, the cost of collection should be materially reduced. The problems yet to be solved are: How old or how large the trees should be before they are ready for tapping; how to reduce the amount of bark cutting without loss; how often and for what length of time it is best to rest the trees; whether to use the single "V" method of cutting the bark, the herring bone or some other system. There are also the questions of whether or not it is best to cut the trees on both sides at the same time or alternately; the frequency of tapping and its effect on the quantity, richness and strength of the rubber; the number of trees most profitable to plant to the acre, etc., etc. I found a difference of opinion as to what tapping tools were best to use and the method of treating the latex. One question appears to be settled, however, and that is that in this part of the world the Hevea is the most satisfactory tree to plant and is being planted almost exclusively. It grows well, is hardy and will stand a great deal of abuse, while the cost of gathering the latex is less and the profit consequently greater with this variety than with any other.

Problems.

Variety Planted.

The yield of rubber per acre per annum is also greater than with other varieties. Ceara is planted to a very small extent in parts of Ceylon on the higher elevations where Hevea does not do as well. Ficus Elastica was planted to quite an extent at one time but is now being abandoned or cut out. Castiloa does not do well as it grows very slowly.

HEVEA OR "PARA" RUBBER.

Physical Conditions.

Hevea or "Para" rubber does best where the temperature does not go below 60°, but localities where the temperature does not go below 65° are preferred. The temperature in Malaya and Ceylon does not vary more than four degrees between the cooler and warmer months. The climate is very humid. January is the coolest month while March is the warmest. The following table shows the weather reports for the months of April, 1907, to March, 1908, inclusive. These readings were taken at Kuala Lumpor, State of Selangor, F. M. S., which is about the center of the largest plantings in Malaya.

1907	Mean Barometrical Pressure at 32 F	Maximum in sun........	Temperature: Mean dry bulb........	Temperature: Maximum	Temperature: Minimum.........	Temperature: Range............	Hygrometer. Mean wet bulb........	Hygrometer. Vapour Tension......	Hygrometer. Dew Point.........	Hygrometer. Humidity..........	Prevailing direction of Winds	Total Rainfall	Greatest Rainfall During 24 Hours..........
April.	29.814	145.3	81.0	91.1	71.6	19.5	76.5	0.832	73.7	78	Calm	12.69	2.48
May..	29.883	149.2	80.8	90.5	71.8	18.7	76.5	0.830	73.6	79	Calm	7.55	2.53
June..	29.883	147.6	80.3	90.0	71.1	18.8	76.1	0.819	73.2	78	S W	7.44	3.56
July ..	29.872	147.1	80.5	90.4	71.3	19.1	76.3	0.825	73.4	79	S W	3.37	0.90
Aug ..	29.884	150.8	80.9	90.3	70.6	19.7	76.2	0.818	73.0	77	S W	0.72	0.72
Sept..	29.822	147.8	80.7	90.7	70.9	19.8	76.5	0.833	73.7	79	S W	6.69	1.26
Oct...	29.874	141.3	79.4	89.5	70.7	18.8	76.0	0.840	73.6	83	S W	12.38	2.43
Nov...	29.881	149.8	80.3	89.3	71.1	18.2	75.8	0.810	72.9	78	S W	7.73	1.50
Dec...	29.877	137.0	78.9	89.3	70.2	19.1	75.8	0.828	73.7	84	S W	18.92	3.65
1908													
Jan ..	29.875	147.2	80.9	90.5	71.1	19.4	76.6	0.839	73.8	79	N W	7.71	5.20
Feb ..	29.883	149.6	80.8	90.1	70.6	19.5	75.6	0.807	72.9	77	Calm	14.01	3.00
March	29.880	143.9	80.2	89.8	70.8	19.0	76.8	0.820	73.5	79	S W	10.10	2.67

Rainfall. The rainfall in the countries visited is very great and well distributed over the year. Para seems to do best in districts where the rainfall is from 70 to 150 inches per annum. An experiment with irrigated Para trees is being carried on at the present time in Ceylon in a district where there is little rainfall and in a locality where the trees are exposed to the wind which tends to wither the leaves. Irrigatetd trees in dry districts would in all probability do well if they were protected from the wind. There are no strong winds in the rubber districts, the wind seldom exceeding a velocity of 20 miles an hour below the 3000 feet altitude.

Wind. Flat low land was originally preferred for rubber plantations but rubber does equally well in rolling or hilly country. The elevation at which most of the rubber is planted is below 200 feet. The thirty year old Hevea trees at Peradeniya at an elevation of 1500 feet above the sea level, however, show an excellent growth.

Soil. The soil in Malaya is alluvial and in some localities mixed with a moderate amount of sand. Photo No. 1 shows 15 months old Hevea growing on such soil. Sandy soil, however, is unsuitable while rocky soil is generally favorable. The following gives the analysis of some of the soil in Ceylon. I quote from Circular No. 6, Volume III, of the Royal Botanic Gardens, Ceylon, a copy of which was kindly furnished me by Dr. Willis:

No. 1. 15 months' old Hevea.

"CEYLON SOILS IN WHICH RUBBER IS PLANTED.

It is obvious that since Para rubber has been planted from sea level up to 2,000 feet in districts such as Galle, Baddegama, Kelani, Ambalangoda, Kalutara, Ratnapura, Polgahawela, Veyangoda, Kadugannawa, Peradeniya, Matale, Kurunegala, Badulla, and Passara, there must necessarily be considerable variation in the chemical and physical properties of the soils now under this product.

The land in rubber is, in the south of the Island, mainly flat; here and there steep rocky hillsides similar to what one sees up-country are planted in rubber, but one has to leave the south of the island and go to the Central and Uva Provinces in order to see large areas of rocky, hilly land planted with this product. In many districts the alluvial soils along the banks of rivers have been planted, in most cases below flood level, so that the conditions of the Amazon valley are to some extent imitated.

Experiments have been commenced in dry, but irrigable areas. The want of rain in proper proportions and quantities may prevent the extension of rubber in the northern part of the island, where only the northeast monsoon is felt and where the annual rainfall varies from 40 to 60 inches.

The soil types in which Para rubber is being cultivated may therefore be roughly divided into the following:

1. Cabook.
2. Alluvial soils.
3. Tea and cacao soils.
4. Swamps.

The cabook soils are met with as local areas in many districts. They are usually inferior from a chemical and physical standpoint, though in many cases the growth of the rubber trees appears to be satisfactory. Such soils usually show a small percentage of organic matter, potash, phosphoric acid and lime. A typical example shows the following composition:

ANALYSIS OF TYPICAL CABOOKY SOIL.

Mechanical Composition.

	Per Cent.
Fine soil passing 90 mesh..................	11.50
Fine soil passing 60 mesh..................	9.50
Medium soil passing 30 mesh...............	4.00
Coarse sand and small stones...............	75.00
	100.00

Chemical Composition.

Moisture	3.300
Organic matter and combined water	8.000
Oxide of iron and manganese	7.400
Oxide of alumina	8.200
Lime	0.060
Magnesia	0.054
Potash	0.085
Phosphoric acid	0.010
Soda	0.074
Sulphuric acid	0.008
Chlorine	0.003
Sand and silicates	72.806
	100.000

Containing nitrogen	0.128
Equal to ammonia	0.156
Lower oxide of iron	Trace
Acidity	Much
Citric soluble potash	0.006
Critic soluble phosphoric acid	Nil

Alluvial Soil.—For physical properties these soils are usually good, and the amount of sediment periodically deposited during floods adds considerably to the chemical richness of the soil.

They are largely composed of the lighter materials carried down in suspension by moving water. The particles are very fine, most of them passing a 60 mesh. The fineness of such soils partly depends on the speed of the moving water; the swifter the flow the coarser the particles.

The particles are arrested and precipitated all along the banks of the river during flood time. During heavy floods very large quantities of matter are often deposited along the banks, but they are often of a coarser nature due to the higher speed.

The particles which go to make up all alluvial soil may have been brought from considerable distances; they constitute the fine parts of soils liable to wash within the drainage area of the river. Attempts have been made in some countries to regain this suspended soil by the process called "warping," which is only practicable in the neighborhood of tidal estuaries. This is accomplished by letting the water run over the land, and then cutting it off from the main supply by sluices; after some time, by repeatedly going through this process, a soil is built up. This artificial alluvial soil is usually rich in organic matter and other plant food, but usually poor in soluble food such as potash.

An example of an alluvial soil is given below. The sample was taken from the banks of the Mahaweli-ganga at Peradeniya:

ANALYSIS OF ALLUVIAL SOIL, EXPERIMENT STATION, PERADENIYA.

Mechanical Composition.

	Per Cent.
Fine soil passing 90 mesh	53.90
Fine soil passing 60 mesh	43.00
Medium soil passing 30 mesh	3.00
Coarse sand and small stones	0.10
	100.00

Chemical Composition.

Moisture	3.000
Organic matter and combined water	11.000
Oxide of iron and manganese	8.000
Oxide of alumina	9.717
Lime	0.130
Magnesia	0.259
Potash	0.162
Phosphoric acid	0.076
Soda	0.188
Sulphuric acid	0.054
Chlorine	0.014
Sand and silicates	67.400
	100.000
Containing nitrogen	0.230
Equal to ammonia	0.280
Lower oxide of iron	Much
Acidity	Neutral
Citric soluble potash	0.013
Citric soluble phosphoric acid	Trace

The sample is a micaceous loamy deposit in a fine state of division with a fair retentive power of moisture. There is a fairly good supply of organic matter with a good supply of nitrogen. The acidity, as it is to be expected, from such a soil is nil. The mineral plant food is good in lime, magnesia, and potash, mainly derived from the mica, but is rather poor in phosphoric acid.

3. *Tea and Cacao Soils.*—On many estates the tea and cacao has been interplanted with rubber, and the variation in soil composition is very great.

The following analyses show the composition of tea and cacao land now planted with rubber, and the latter showing a good growth in the Peradeniya district:

ANALYSIS OF SOIL FROM TYPICAL CACAO LAND INTERPLANTED WITH RUBBER.

Mechanical Composition.

	No. 1. Per Cent.
Fine soil passing 90 mesh	48.00
Fine soil passing 60 mesh	42.00
Medium soil passing 30 mesh	8.00
Coarse sand and small stones	2.00
	100.00

Chemical Composition.

Moisture	3.600
Organic matter and combined water	4.600
Oxide of iron and manganese	7.200
Oxide of alumina	6.786
Lime	0.160
Magnesia	0.216
Potash	0.077
Phosphoric acid	0.064
Soda	0.233
Sulphuric acid	0.048
Chlorine	0.016
Sand and silicates	77.000
	100.000
Containing nitrogen	0.100
Equal to ammonia	0.122
Lower oxide of iron	Trace
Acidity	Fair
Citric soluble potash	0.008
Citric soluble phosphoric acid	Nil

ANALYSIS OF SOIL FROM TYPICAL TEA LAND INTERPLANTED WITH RUBBER.

Mechanical Composition.

	No. 1 Per Cent.
Fine soil passing 90 mesh	34.00
Fine soil passing 60 mesh	25.00
Medium soil passing 30 mesh	10.00
Coarse sand and small stones	31.00
	100.00

Chemical Composition.

Moisture	3.000
Organic matter and combined water	6.000
Oxide of iron and manganese	5.200
Oxide of alumina	13.049
Lime	0.160
Magnesia	0.490
Potash	0.401
Phosphoric acid	0.089
Soda	0.137
Sulphuric acid	0.068
Chlorine	0.006
Sand and silicates	71.400
	100.000
Containing nitrogen	0.162
Equal to ammonia	0.195
Lower oxide of iron	Trace
Acidity	Much
Citric soluble potash	0.025
Citric soluble phosphoric acid	Trace

4. *Swamps.*—The cultivation of rubber in such areas has during the last year shown a considerable increase. Providing the draining and liming of the soils are efficiently carried out there seems no reason why continued satisfactory growth should not be obtained on such land.

The drainage should be very thorough so as to allow a good percolation of air and water through the otherwise sour soils.

In some cases each rubber tree should have a separate drainage system, the drains being two or more feet wide and 3 to 4 feet deep, the material from them being heaped up near the rubber tree. In other cases each line of rubber trees may be separately drained. When the drains are sufficiently large and the soil from them is heaped around the rubber, a dry soil is ultimately obtained, in areas which have hitherto been too swampy for any cultivation except paddy. The following analysis will show the general composition of such a soil:

ANALYSIS OF SWAMPY RUBBER SOIL FROM THE SOUTHERN PROVINCE (BLACK SOIL).

Mechanical Composition.

	Per Cent.
Fine soil passing 90 mesh	59.00
Fine soil passing 60 mesh	36.00
Medium soil passing 30 mesh	1.00
Coarse sand and small stones	4.00
	100.00

Chemical Composition.

Moisture	5.600
Organic matter and combined water	20.400
Oxide of iron and manganese	1.200
Oxide of alumina	5.232
Lime	0.050
Magnesia	0.115
Potash	0.061
Phosphoric acid	0.064
Soda	0.182
Sulphuric	0.048
Chlorine	0.048
Sand and silicates	67.000
	100.000
Containing nitrogen	0.448
Equal to ammonia	0.544
Lower oxide of iron	Much
Acidity	Much
Citric soluble potash	0.009
Citric soluble phosphoric acid	Nil

The above composition shows a chemical richness in organic matter and nitrogen which rarely obtains in low-country districts and strongly reminds one of the soils at high elevations in Ceylon. It is to be regretted that the area of such rich land in the low country is small, and the above analysis is certainly encouraging to planters who have swampy soils capable of being effectively drained and made sweet by the application of lime or by burning. To a certain extent the method to be adopted with such soils is similar to that for the peaty tracts of the Nuwara Eliya District."

Clearing. In planting rubber, land is usually selectetd that is covered with virgin forest. The forest trees are felled and allowed to lie on the ground until there is a dry spell, when they are burned off. Stumps are not removed, neither are the tree trunks that do not burn, but they are left on the ground to rot. After the burn, with the exception of the large timber and stumps, the land is perfectly clean and ready for planting.

Lalang Grass. Some of the planting is done on fields that were formerly used for tapioca and also rice cultivation. After being abandoned by the planters of these crops the lands become overgrown with "Lalang" grass (Imperata arundinacea), one of the most troublesome weeds in

No. 2. Two year old Hevea. Distance 16x16—167 per acre.

No. 3. Three months' old nursery and laborers' quarters.

No. 4. Same nursery at five months. Plants were one foot high when one month old.

Malaya, which grows and spreads like our Hilo grass. Lalang is an oily grass and cattle will not eat it. Fortunately it will not grow in shade and consequently is easily kept out of rubber groves where the trees shade the ground nor does it grow in the jungle. The average cost of clearing an acre of lalang is about $24.00 gold, which is more than it costs to fell and clear jungle forests. Photo No. 2 shows two year old Havea growing on an old lalang field.

Planting.

Planting is done from seed. The seed is oval in shape and about the size of an Ohia seed. The bulk of the seed crop ripens in August and September, although the trees seed more or less all through the year. As the seed quickly loses its germinating power it is planted soon after ripening.

Methods of Planting.

The planting of Hevea trees is done in different ways. Unquestionably trees planted "at stake" grow much quicker than trees planted in any other way and if the seeds were plentiful at all seasons of the year there probably would be more planting "at stake." In Ceylon the method that is considered the best is to plant the seeds in woven palm leaf baskets about 8 inches in height and 4 inches in diameter and when the plants are about a foot high, plant baskets with trees in their permanent positions. This basket method comes nearest to planting at stake and there is minimum interruption in the growth of the young plants in setting them out. The more general method, however, in the far east is to plant seed in nurseries about six inches apart. Seventy-five to ninety per cent. of the seeds planted germinate.

Nurseries.

The ground selected to be used as a nursery is carefully prepared. It is thoroughly dug up and weeds and roots removed and the soil pulverized by hand. The young plants are left in the nurseries for several months, until they are from 18 inches to two or three feet in height, when they are stumped, the tap roots cut, and the plants transplanted, removing as little soil from the roots as possible.

Transplanting.

Transplanting has to be done when the weather is favorable and after the land has been cleared and burned. As dry weather is necessary for a good burn, the time for transplanting varies and depends on weather conditions. The young trees are planted in rows but the distance between the trees and between the rows varies a great deal on different plantations. There is a difference of opinion on this point, but it is generally considered to be a fact that planting closer than 200 trees per acre is a failure.

A great deal of the planting at the present time is in avenues.

Planting in Avenues. In Ceylon most planting now being done is in avenues twenty feet wide, the trees being fifteen feet apart. They are planted so that the avenues run east and west. This gives the sun a chance to shine on the soil. In Malaya most planting is now being done 12 by 24 or 148 to the acre. Some planting is being done 15 by 30 or 96 per acre. One plantation I visited was planting in equilateral triangles, the trees being 17½ feet apart or 160 per acre, as against planting in rectangles 17½x17½, which would give only 140 per acre.

Weeding. Most plantations weed clean. This is very expensive and there are some plantations that weed only in rows while others weed still less. I saw on one of the best paying estates, a field of two year old trees growing in a lalang patch where they had had only weeded the lalang around each tree. These trees were doing very well. On a great many plantations the weeds are easily cleaned out after the burn and by keeping them down at first the expense of weeding is not great. Such land cannot be compared with our land where we have Hilo grass to contend with. In Ceylon the older men prefer clean weeding, but green manuring is coming in vogue rapidly.

Draining. In places where the land is low and swampy it is drained so that there will be no standing water around the trees. Where the trees are planted on the hill sides drains are dug at intervals to prevent the water carrying away the top soil.

Cultivating. There is no cultivation as a rule beyond hoeing the weeds as the soil does not pack and consequently does not need to be loosened. Photo No. 6 shows trees two years and seven months old, planted in a field which was "chunkeled" (hoed) to a depth of from six to nine inches before being planted. The trees show a more than average growth, several of the trees being 20 inches in circumference three feet from the ground. This photo also shows how the land is drained.

Hevea grows in two forms, one more bushy than the other. Planters in Ceylon and Malaya prefer a tree fairly branched. There is a great deal of thumb nail prunning to make the trees branch at the height desired. This also has a tendency to make the tree large at the base. If a tree branches at 10 or 15 feet from the ground it is about right. Planters who have "topped" their trees state that it results in two large branches forming which is apt to split the trunk where the two branches meet, if the wind is strong. The more leaf area a tree has the better and the quicker will the "bark respond." Photos Nos. 7 and 8 show Hevea trees that have had plenty of room in which to grow and have branched naturally, while Photo No. 9 shows trees that have been prevented

No. 5. One year old trees and drain.

No. 6. Hevea planted 12x24—148 per acre. Age 2 yrs. and 7 mos. Large tree 20½ inches circumference.

No. 7. Eleven year old Hevea planted 24x24—74 per acre. Branches 15 feet from the ground.

No. 8. Seven and one half year old Hevea. Same tree as Photo No. 14.

No. 9. Eleven year old Hevea planted 10x10—435 per acre.

from branching by being planted too close together. The question of how close or how far apart the trees should be planted is one that has had a great deal of attention and is one of vital importance.

How Close to Plant.

In considering the problem of how many trees it is best to plant to the acre, it is necessary to consider conditions as they are likely to exist in the future. In planting rubber for profit, it is the percentage of profit on the capital invested which determines its value as an investment rather than the gross earnings or profit per tree or per acre, or the total output of the plantation.

If we let

A. Represent the acreage planted.
X. Represent the number of trees per acre.
T. Represent number of times a tree is tapped per year.
C. Represent capital invested.
N. Represent the number of trees per day one man can tap.
y. Represent yield per tree per day's cutting.
p. Represent price per pound of rubber.
L. Represent days wage per laborer.
E. Represent expenses (other than labor).

Then the market value of the rubber collected from one tree at a single tapping, less the cost of collecting same in laborers' time, multiplied by the total number of tappings per year on all the trees, less general expenses other than labor, will be the total profit for the year. Dividing this by the capital invested will give the percentage of profit on the investment or;

Percentage of profit on capital invested $= \dfrac{A\ X\ T\ (py - \frac{L}{n}) - E.}{C}$

In this equation the value of X varies directly as C and inversly as y. The more trees planted to the acre or the larger X is the smaller the yield y will be and also the larger the capital to be invested, C. Then again the more py exceeds $\frac{L}{n}$ the greater will be the profit. Experience must determine what effect increasing X has upon the value of p and y; hence to arrive at the number of trees per acre that it is best to plant in order to try and obtain a maximum value of the percentage of profit on the capital invested we must consider:

C. Capital invested.
L. Cost of labor when trees come into bearing and also what it will be in the next ten and twenty years.
p. Market price of rubber in five, ten and more years.
y. Yield per tree at each single tapping.

T. Number of times per year it is best to tap each tree to get the best results.

n. Number of trees per day one man will be able to tap.

Some planters think it will be more profitable to plant for a period of ten or fifteen years only while others have confidence in the future beyond that time.

Effect of Close Planting.

If trees are planted too close together they grow tall and have small leaf area and under these conditions the bark does not grow quickly as on trees planted wider apart. Neither does the new bark form and grow over the tapped surface as quickly as in wider planting and it is now found necessary to rest a too closely planted forest, while continuous tapping can be made on wider plantings. Photo No. 10 shows trees that were planted too thickly with the result that the usual tapping area having been cut the renewed bark is too thin to tap so that experiments are being made in tapping up to 12 feet high. The trees are usually considered large enough to be tapped when they are twenty inches in circumference three feet from the ground, but one grove that I saw that was planted 10x10 or 436 to the acre, although large enough in circumference when five years old, the bark was found to be too thin to tap. On another plantation they were tapping two groves of the same age, 8½ years, one planted 12x24 or 148 per acre (see Photo No. 11), and the other 12x12 or 296 per acre. The 12x24 trees gave an average yield of 3 pounds per tree while the 12x12 trees averaged a little less than 1¾ pounds and gave less on second tapping, thus acre for acre, the yield was about the same. The yield of rubber from each tree for each day's tapping was almost double from the trees in the 12x24 planting as compared with the 12x12 planting and as each coolie makes 80 tappings per day in either grove the cost of collecting a pound of rubber is nearly double in the grove more thickly planted.

Widest Planting.

Photo No. 7 is a grove planted 11 years ago 24x24 or 74 per acre. In talking with the gentleman who planted these trees he stated that if he were planting for himself he would plant at least 24x24 (74 per acre), and perhaps 30x30 (46 per acre). That he would do this with the idea of making good profit twenty years from now as well as in the earlier years. Photo No. 12 shows eleven year old trees planted 60 to the acre. Eight hundred trees in this planting averaged a yield for the year of seven pounds or 420 pounds of rubber per acre.

Growth.

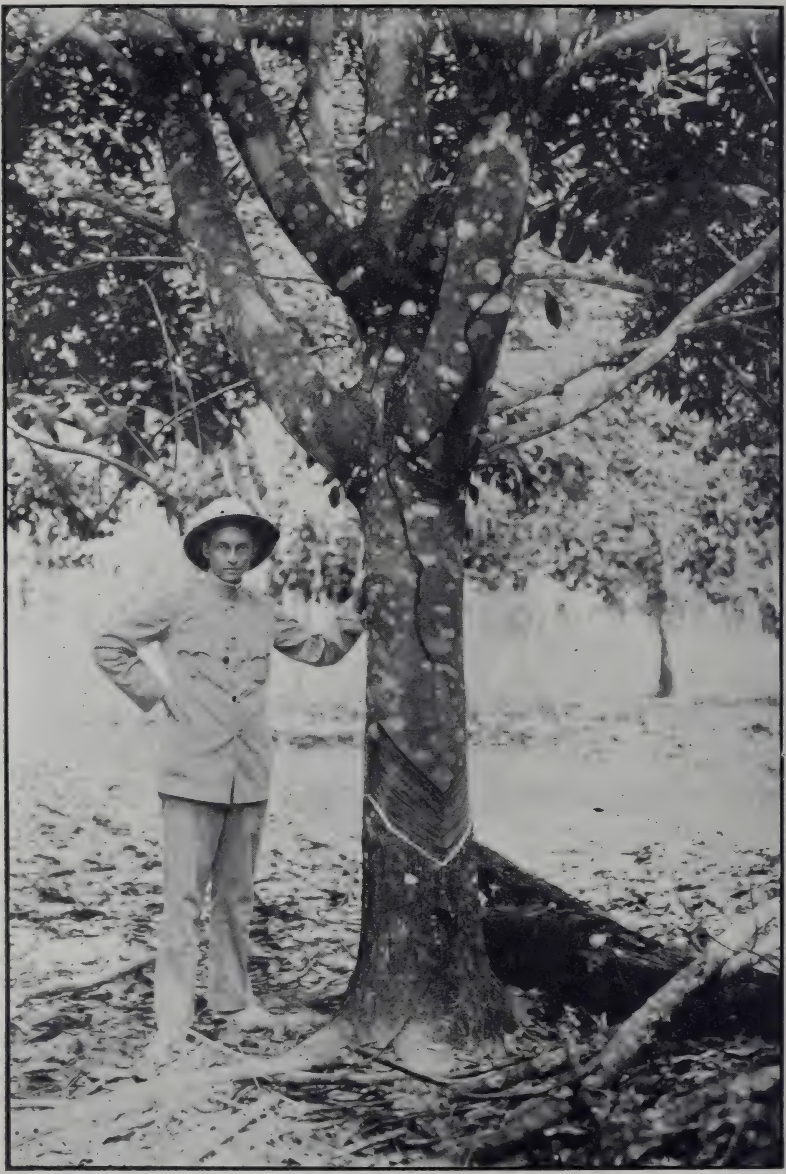
Trees in Malaya usually attain a circumference of 20 inches three feet from the ground in from four to five years. In Ceylon a few trees will reach this size in five to six years, many in six to seven years, and are tapped at the base when they measure twenty inches.

No. 10. Tapping twelve feet high. Eleven year old trees.

No. 11. 8½ year old Hevea planted 12x 24 148 per acre.

No. 12. Eleven year old Hevea planted 60 per acre. Average yield 7 pounds per tree.

No. 13. Herringbone system of tapping.



No. 14. Single "V" tapping. 7½ year old tree; same tree as Photo. No. 8. Planted 30x30.

No. 15. Tapping tree in grove planted 12x24—148 per acre.

No. 16. Marking Hevea tree before tapping.

Tapping. Hevea is usually tapped every second or third day with rests every dry season. Some estates tap as above for 15 tappings and then rest the trees from three to five months. For instance they will tap an area one day and another the next day. If the trees are planted wide enough apart this can be kept up indefinitely, tapping each tree from 30 to 45 times a year. Tapping is usually done in the morning before the heat of the day. Some of the larger plantations tap all day or until two o'clock. The flow is better in the early morning. To tap, a farrier's knife, a carpenter's gouge or some special tapping tool, is used to cut the bark. A lateral cut in the bark is made, care being taken not to cut through the cambain; it is made in such a way that the latex runs down in a groove until it reaches a tin or aluminum cup which is placed at the foot of the tree. See Photo No. 13.

There are a number of ways in which the cuts are made, the simplest being a "V" as in Photo No. 14.

The system as shown in Photo No. 13 is called the herringbone system. There are a number of modifications of this system such as the half herringbone system shown in Photo No. 10, in which the lateral cuts are all made to run into a vertical cut. Some times the slanting cuts will go half way round the tree, one side of the tree being tapped this way until all the bark has been cut and then the other half is tapped, the lateral cuts running into the vertical cut on the opposite side of the tree. Sometimes both sides of the tree will be tapped by this system at the same time, as in Photo No. 10, a cup being placed on either side of the tree under the vertical cut. Again two sides of the tree will be tapped at the same time on the half herringbone system with the lateral cuts only extending a quarter of the way round the tree, so that the two sections on opposite sides of the tree will be tapped at the same time, while the intervening sections will not be tapped until all the bark has been cut on the first sections.

Photo No. 16 shows the coolies marking a tree on that portion of the bark that has not been tapped at all. The space between the cuts is measured and a light cut made just deep enough to show the tapping coolie where to tap. Each time a tree is tapped a little mark is made on it so that there is a record kept as to how many times a tree has been tapped.

In the grove shown in Photo No. 11, where the average yield is 3 pounds per tree, the half herringbone system of tapping was being used on both sides of the tree, the laterals going quarter of the way round only. Each tree was tapped every other day for 15 tappings, and then the trees were rested for three months, so that during the year 45 cuts were made on each side of the tree.

A day's work for the tapping coolie was to tap 40 trees on both sides, thus setting out 80 cups to catch the latex.

Day's Work. The coolie's work was not completed until he had picked up the thin strips of bark which were cut in tapping bringing them, together with 80 cups of latex, to the drying room. He then, after pouring the latex into a large container, must rinse the cups with water, saving the diluted latex thus obtained so that it would not be lost. He then washes the cups which completes his day's work. Women and children tap as well as men. The aluminum cups each hold about a half pint. A little water is put in each cup when it is set out so as to dilute the latex and prevent it from coagulating before it can be brought to the drying room. The amount of latex in each cup of course varies with the yield of the tree. Some trees filling the cups full.

Scrap Rubber. The bark shavings that are brought in are put through the scrap machine which consists of rollers which grind the bark into a fine powder. The larger portion of the bark is separated from the scrap rubber after it comes out of the rollers, and then the rubber, and whatever bark that has not been separated, is put through a second set of rollers on which streams of water are playing. This washes the remaining bark from the scrap and the rubber is turned back into the rollers over and over again until it is in the form of crépe rubber. It is then hung up to dry with the other rubber. The latex when it is brought in is strained and set out in pans as milk is set to cream and in three or four days the rubber coagulates in blocks about the size of half of a kerosene oil tin.

On several plantations they were using kerosene oil tins cut in half so that the two opposite sides of the tin would be the bottoms of the coagulating pans. Most plantations mix a little acid with the latex before it is set out in the coagulating pans to aid coagulation. The block of coagulated rubber is sometimes rolled into sheets and sold as sheet rubber, but oftener it is put through rollers under pressure on which streams of water are playing until it is ground into the form of crépe rubber. On one or two plantations the crépe or sheet rubber is compressed into blocks. The drying room or house is very often made of corrugated iron, or at least the roof is corrugated iron, and the rubber is hung up to dry as shown in Photo No. 17.

Some plantations use a vacuum dryer for drying the rubber.

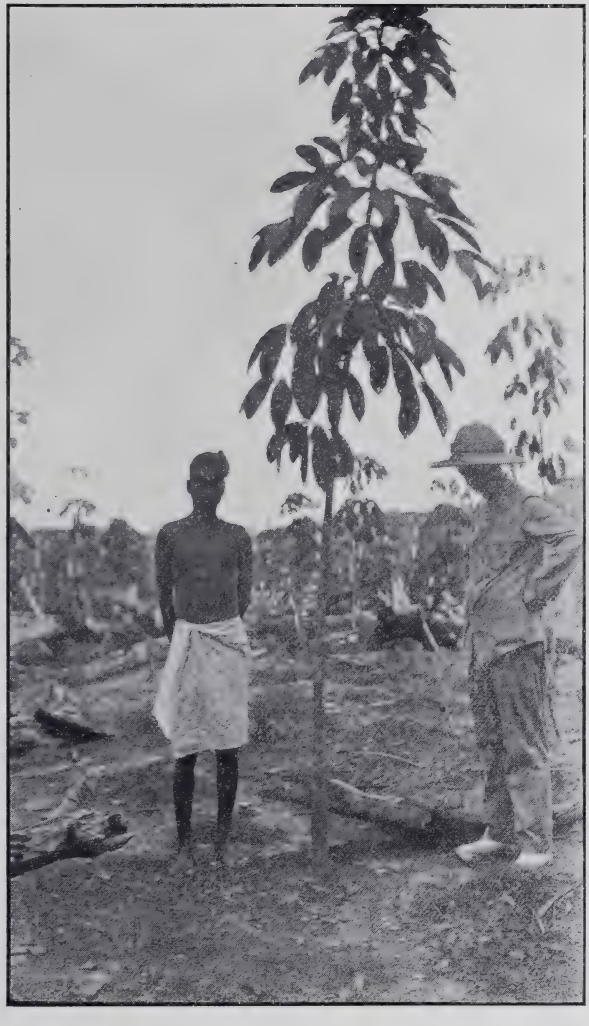
As there are so many methods of tapping employed on the different plantations, it is hard to say which system will eventually be perfected. I found, however, that where the single "V" system was used the amount of rubber collected per day for each coolie tapping and collecting was almost double that of plantations where they were using other systems in which five times as much bark was cut per tree.

No. 17. Drying and Packing Room.

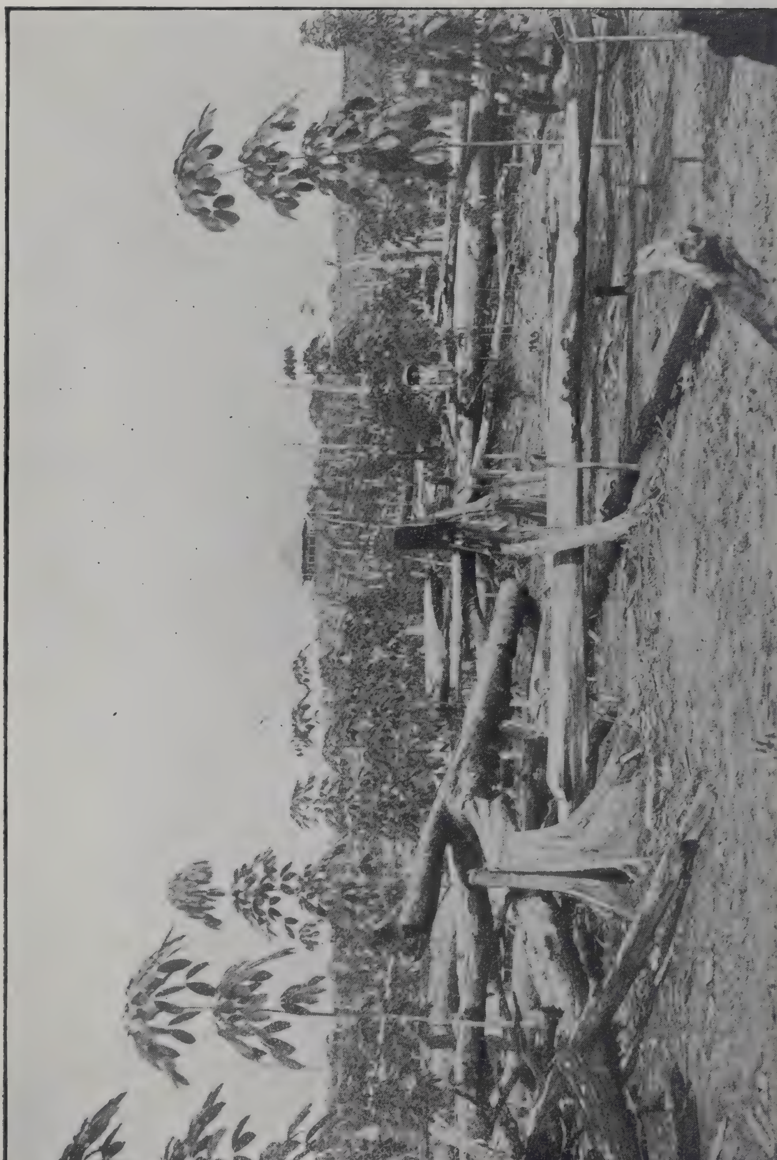
No. 18. Tamil Coolies.

No. 19. Tamil Girl.

No. 20. Javanese Women and Mandor (luna).



No. 21. 14 months' old Hevea and Tamil Coolie.



No. 22. 14 months' old trees.

No. 23. 8 months' old tree. Average size of trees in 50 acre planting. Hand indicates growth since transplanting. Stumped and transplanted from 8 months' old nursery.

Labor. Coolies get about 37 rupe cents per day in Ceylon or 12 cents U. S. gold. In Malaya about 30 to 35 cents Straits Currency or 18 to 20 cents U. S. gold, and they work about 24 days, of 8 to 10 hours each, per month. Most of the coolies are Tamils, Javanese coming next in number, while the native Malays are employed principally in felling and clearing forests and in digging drains by contract. In Ceylon out of 450,000 laborers employed in different industries, 400,000 come from India. The Tamil coolies do not expend very much on clothing and a great many of them manage to save money to remit to India. They are not a muscular people, having very slender arms and legs, but they can carry a greater weight on their heads than they are capable of lifting. In tapping rubber trees, the Tamils are very good as they are very quick and it is not hard work. The Javanese are good workers and also good at tapping. The women work in the fields as well as the men, but do not get as large wages.

The output of a rubber plantation depends on the average age of the trees tapped. As the trees grow older the output will increase, but to what extent remains to be proved by experience. The output of one plantation in 1906 of 134,285 pounds increased in 1907 to 193,506 pounds from 84,278 trees tapped during that year or an average of over two pounds per tree.

Their largest trees are 11 years old, but two-thirds of them were under six years old.

This plantation was using the half herringbone system of tapping, the laterals going half way round the tree to the verticle cut on one side while the vertical cut on the opposite side drains the lateral cuts from the other side of the tree. On the new trees that are coming into bearing they are using the single "V." A tapping is made every other day on some of the trees and every third day on others for a period of six weeks when the trees are rested for six months. There is an average of one tapping coolie to three acres and a carpenter's gouge is used for a tapping tool.

CEARA RUBBER.

Most of the remarks in reference to Hevea apply also to Ceara with some important exceptions.

Twenty-three years ago Ceara was planted as shade for tea plants, but on account of inexperience in tapping and as the Ceara trees were not satisfactory as shade, they were, unfortunately, nearly all cut out. Ceara rubber trees can be planted and will grow well at higher elevations than Hevea. Most of the Ceara trees I examined were growing at an altitude of from 500 to 3,000 feet above sea level. Ceara can be planted where the temperature

goes as low as 45 degrees, but a temperature above 50 degrees is preferred. As to rainfall, Ceara does best where there is 50 to 120 inches of rain per annum. The best Ceara I saw was in a district where the rainfall is only sixty inches per annum. The trees will grow in rainier districts, however, but tapping is not so successful as in drier districts. Photo No. 24 shows some Ceara trees growing in the Botanical Gardens at Buitenzorg in Java, where experiments in Hevea rubber tapping are being carried on very carefully. The rainfall at the garden is 180 inches per annum. The Ceara trees shown in the picture are 8 years old and though they grow tall, the largest is only 24 inches in circumference three feet from the ground, while the others are much smaller.

On arriving in Ceylon, I found that there was only one estate on which there were Ceara trees being tapped to any extent and the output on this estate amounted to only 4,000 pounds of rubber per year.

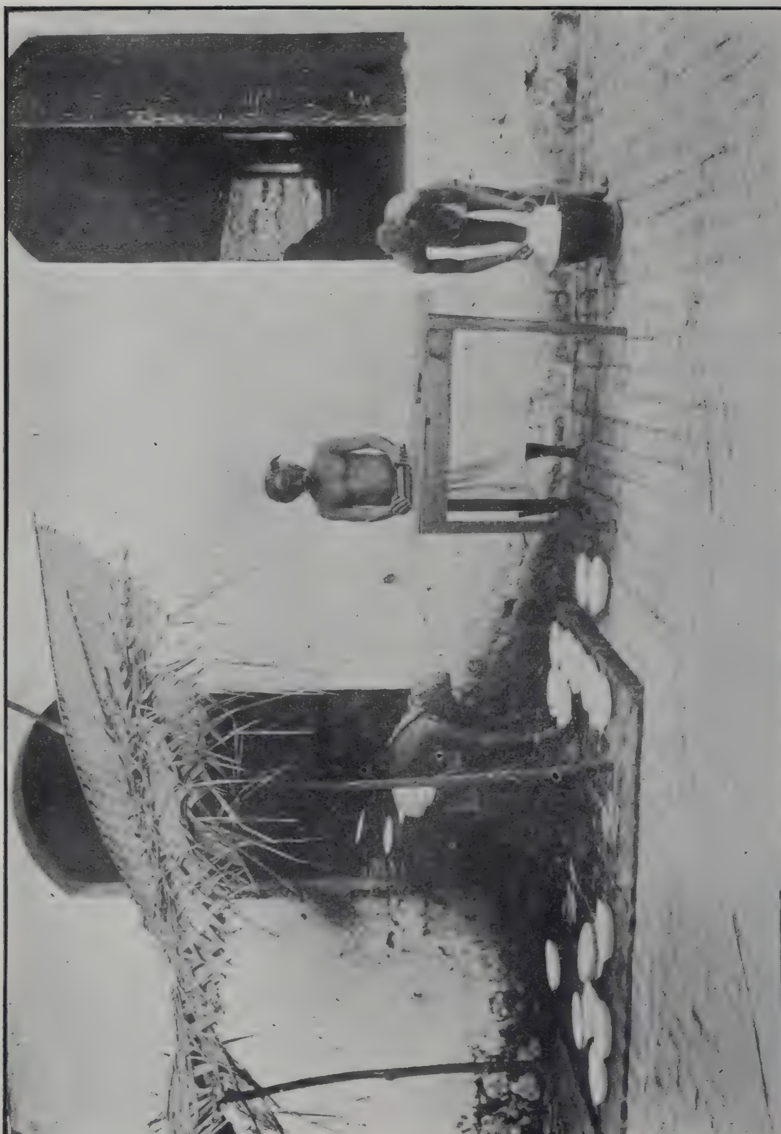
The main planting on the estate was Cacao, Cocoanut and Ceara Rubber trees being planted for shade. No new Ceara rubber trees are being planted out, but from the young trees that spring up the best only are allowed to grow while the poorer ones are cut out. As a rule these trees are 20 inches in circumference three feet from the ground when they are three years old and are then old enough to be tapped profitably. The manager thinks that the yield is greater when the trees shed their leaves. The growth of these young trees varies a great deal and trees that get a start when the weather is showery in the morning and sunny in the afternoon grow quicker than those that sprout when the weather is too rainy and is cold at night. An ordinary curved pruning knife is used in tapping on this plantation. The bark is cut through the cambian to the wood, removing a piece of bark an eighth of an inch wide. "V" cuts are made one above the other a span apart but no vertical cut is made, the latex being allowed to flow over the bark. The manager claims that they get less scrap rubber in this way. The tree is tapped until an inch of wood is exposed. Photos Nos. 26 and 27 illustrate this method of tapping. The other side of the tree is tapped in the same way and then the tree left until the bark grows over. There is not the "wound response" in the Ceara that there is in the bark of the Hevea tree so that in tapping by this method an eighth of an inch of bark is removed each time the wound is reopened in order to get a good flow. With the Hevea it is only necessary to reopen the wound and the thinner the shaving the better. On account of the "wound response" the flow of latex increases as the tappings proceed up to a certain point. This is not the case with the Ceara which is more apt to be the other way.

No. 24. Ceara trees at Buitenzorg, Java, 8 years old.

No. 25. Cocoa Plantation with Cocoanut and Ceara Rubber Trees planted between the Cocoa.

No. 26. Tapping Ceara. Age of tree 4 or 5 years. Circumference 3 feet from the ground 28 inches.

No. 27. Same tree as Photo. No. 26.



No. 28. Making Ceara Rubber "Biscuits."

No. 29. 20 year old Ceara tree, showing method of tapping.

It will be noticed in Photo No. 26 that a round patch of the bark has rotted and will eventually come off. This is due to wet weather immediately after tapping, the water having soaked in between the bark and wood. When the bark comes off in this way the shot hole borer attacks the tree, weakening it, and it is likely to blow over when there is a strong wind. Experience has been that in the more rainy districts of Ceylon tapping has been unsuccessful, killing a great many of the trees.

The bark of the Ceara rubber tree is thinner than the Hevea and has a tendency to tear if the tapping knife is not sharp. This makes it harder to tap the Ceara when the same methods of tapping are used. It is considered more satisfactory on this plantation to tap as they do rather than use more careful methods as the young trees grow up so quickly that as soon as one tree dies there is another ready to be tapped in its place. A coolie taps the trees, sets out the cups and brings in the latex, setting it out in the pans to coagulate and rolls it into biscuits the next day. This constitutes a day's work for a coolie, if he brings in enough latex to make half a pound of dry rubber.

The rubber biscuit, after being rolled and washed, is spread on cocoanut leaves in the drying room and usually takes about three weeks to dry. As a coolie is paid the equivalent of 12 cents gold per day, it will be seen that the labor of collecting and making the biscuits costs 24 cents per pound. The latex on this plantation is coagulated by being mixed with water. Water coagulates Ceara latex very quickly. This fact makes it more desirable and more profitable to tap Ceara trees in dry weather as the rain coagulates the latex on the tree, making a bigger percentage of scrap. Ceara latex differs in this respect from the latex of the Hevea tree. Where water is used to delay coagulation of the latex from the Hevea tree, it has the effect of hastening coagulation with Ceara latex. This makes it more difficult to handle the Ceara latex than Hevea.

On some of the tea plantations that I visited where they have a few Ceara trees remaining, they are more careful in tapping and use the herringbone method, cutting only a little way into the bark and using a pricker. See Photo No. 29.

The trees are scattered and a day's work for a tapping coolie on these plantations is a third of a pound per day of dry rubber. Here the rainfall is large and more care has to be taken in tapping to preserve the trees.

I visited one plantation where they had a grove of 250 Ceara trees. This was at an elevation of 3000 feet and where the annual rainfall was from 120 to 150 inches. This is the highest elevation at which I saw rubber growing. Twenty-three years ago on this plantation, Ceara rubber was planted as shade for the tea, but later it was all cut out with the exception

of a belt of 450 trees. These trees in the last few years have been tapped, but since tapping commenced 250 of them have died as the result of the tapping. It is considered unsafe at the present time to take more than 250 pounds of dry rubber per year from these 200 trees. Three coolies work on the trees from September to the end of March. The largest tree is 49 inches in circumference, 3 feet from the ground and the tapping system is a series of "Vs" draining into a vertical cut.

A weak solution of ammonia (2% to 5%) is used to prevent coagulation caused by water in the collecting cups, or from coagulation by churning while being carried from the trees to the coagulating rooms.

This plantation gets 4s. and 2d. a pound for their Ceara when Islands Fine (wild) Para brings 3s. and 4d., but 10 pounds of the latter equals 8 pounds of cultivated on account of its having a smaller percentage of moisture, so that prices are really equal. It gets a little better price than plantation Para.

At present they are tapping over renewed bark without finding it necessary to remove any outer bark. The manager here thinks that if the same methods of tapping were used and the trees tapped first when young, that it would not be necessary to remove the outer bark as it would not have time to get too thick. They tap the trees every third day for 7 months, except in rainy weather, cutting a shaving a sixteenth to an eighth of an inch in thickness. The cut is shallow not reaching the cambian, but a pricker is used to augment the flow. As the trees are old trees, the outer bark that was removed was quite thick.

In conclusion I beg to submit the following general facts, conclusions and opinions concerning the rubber industry which I gathered during and in connection with my trip, which I hope may be of value to those interested in rubber production in Hawaii:

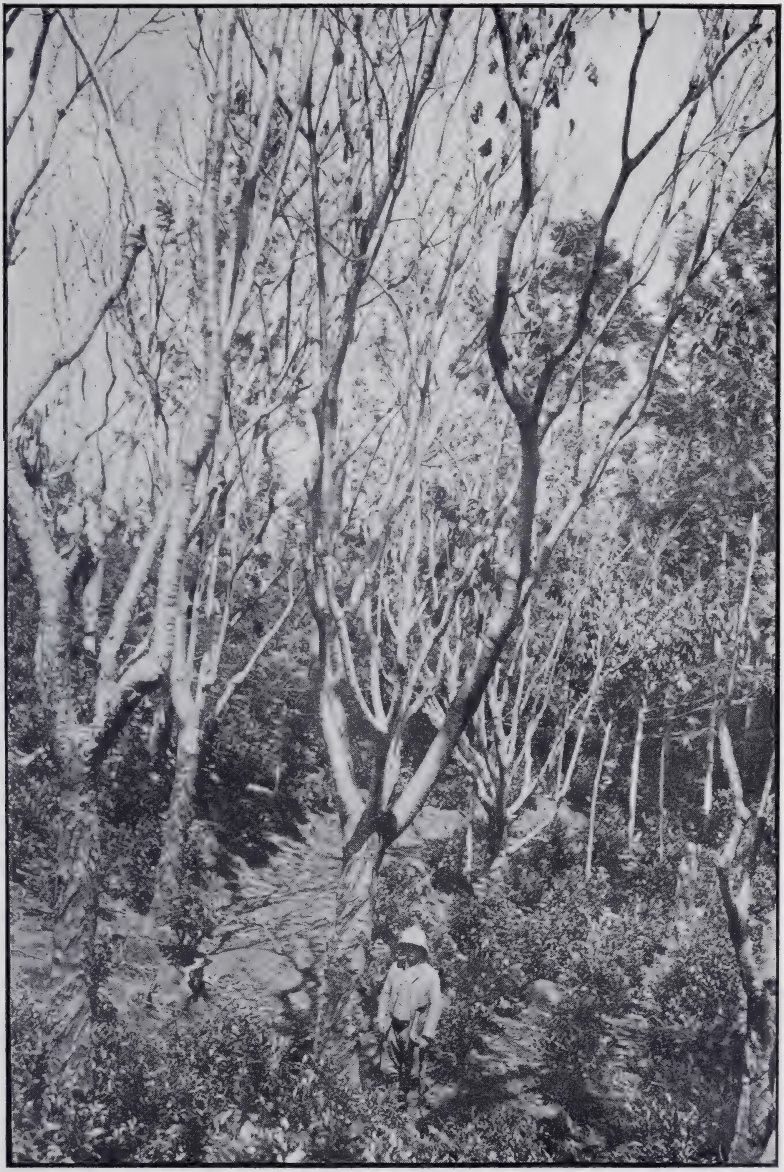
The present rubber production of the world is approximately seventy thousand tons.

The great source of rubber is the forests of Brazil, which produced 41,000 tons in 1907.

The cultivation of rubber is now going on in nearly all the tropical countries of the world, it being most largely engaged in in Mexico, Central America, India, the Malay Peninsula, Ceylon and Java.

It is difficult to ascertain the exact area under cultivation, which is large, but the adaptability of different localities to rubber production has yet to be determined. It is certain that a very large proportion of the areas planted are unfitted for rubber cultivation or the wrong varieties of rubber trees have been planted. There is little danger of the rubber market being overstocked for some years to come from either wild or cultivated sources.

No. 30. Tapping Ceara tree on renewed bark. Rangbodde estate.



No. 31. 23 year old Ceara rubber growing between tea plants. Circumference 49 inches, 3 feet from ground.

No. 32. Tea Estate, Rangbodde, Ceylon. Elevation 3,000 feet.

Although a large area of cultivated rubber has been planted out, the production of the cultivated article has only just begun, as is evidenced by the fact that the output of cultivated rubber from Ceylon and Malaya for 1907 was only approximately 1,178 English tons.

The unknown quantity in Hawaii is the labor question. Tapping requires in Ceylon and Malaya a man for every one to four acres, according to the number of trees planted per acre and the convenience of location of the same.

The price of labor will also be a vital feature. In Ceylon and Malaya the laborer receives from twelve to thirty cents gold per day, while in Hawaii we are obliged to pay seventy-five cents to a dollar per day.

As to the relative efficiency of the labor in the far east and that of the ordinary laborer in Hawaii I am of the opinion that for the work in collecting rubber, our labor is as efficient and will accomplish more, as under local conditions twenty to twenty-five per cent. more time will constitute a day's work.

The Ceara tree will grow much quicker than the Hevea tree, but on the other hand, Hevea will yield more abundantly and the cost of collecting the latex will be less. Comparatively little attention has been given to the methods of collecting rubber from the Ceara variety of rubber trees as there are but a few dollars invested to thousands of dollars invested in Hevea plantings. Tapping experiments should be made as soon as possible on our Ceara plantings in order that more may be known before our trees come into bearing. There is still much to be learned through the experience of others in various rubber producing sections of the world, but, after all, we must very largely work out our own methods and learn for ourselves how best to meet our own problems, although the experience of others will always be of benefit.

Hoping that the facts and figures given in this report will be of benefit to the rubber producers of Hawaii, I have the honor to remain,

Your obedient servant,

FRED. T. P. WATERHOUSE.

BY AUTHORITY.

ARBOR DAY PROCLAMATION.

In accordance with custom, I hereby designate Friday, the 13th day of November, 1908, as ARBOR DAY for the Territory of Hawaii, and recommend that on that day appropriate exercises be held in all schools of the Territory and that part of the day be devoted to the planting of trees and shrubs.

Given under my hand and the Great Seal of the Territory of Hawaii at the Capitol in Honolulu this 3rd day of November, A. D. 1908.

W. F. FREAR,
Governor of Hawaii.

By the Governor:
E. A. MOTT-SMITH,
Secretary of Hawaii.

FIRES TO CLEAR LAND--MOLOKAI.

Notice is hereby given that in accordance with Section 6 of Act 71 of the Session Laws of 1905, it is forbidden to start fires for the burning of brush, dry grass, etc., for a period of three (3) months from November 3rd, 1908, unless the written permission of the District Fire Warden has been first obtained, on that portion of the east end of the Island of Molokai, between the lands of Pukoo and Halawa, inclusive.

The law reads: ''such fires shall not be started during a heavy wind or without sufficient help present to control the same, and the fire shall be watched by the person setting the same, or by competent agents of his, until put out.'' The District Fire Warden is C. C. Conradt of Pukoo.

RALPH S. HOSMER,
Superintendent of Forestry and Chief Fire Warden.
Honolulu, T. H., November 3, 1908.

PER CAPITA LUMBER-CUT.

The United States are cutting timber at the rate of 500 feet board measure each year for every man, woman and child. In Europe the per capita consumption is only 60 feet. At the present rate of cutting, in less than thirty years all our remaining virgin timber will have disappeared.

LUMBERING METHODS.

In the case of yellow pine, which heads the list in the volume of yearly output, it is estimated that only one-half of all the lumber cut is used, the remaining half, consisting of 8,000,000 cords, is wasted. This waste is typical of present day lumbering methods.

THE HAWAIIAN

FORESTER & AGRICULTURIST

VOL. V DECEMBER, 1908 No. 12

During the past year public opinion all over the United States has been aroused as never before to a realization of the necessity for more careful methods in the use of the sources of the material wealth of the Nation—the great natural resources, forests, waters, minerals and lands.

First came the announcement that the President was to call together the Governors of all the States for a conference. Then for six months followed what amounted to a campaign of education. Newspapers and magazines vied with one another in articles on Conservation and helped to work up an interest that reached the point of action at the Conference of the Governors held at the White House in Washington in May.

The Conference of the Governors was a gathering that will be remembered as one of the noteworthy events in American history. It marks the beginning of a new era in the economic development of the Union, for only by the wise use of its natural resources can the Nation continue to enjoy material prosperity.

Following the reappointment by President Roosevelt of the Water Ways Commission and its enlargement into the National Conservation Commission, there have been appointed by many of the Governors, State Conservation Commissions to investigate the resources of individual states and to coöperate with the National Commission in devising plans whereby the natural resources of the Nation as a whole and of each state and territory may be properly developed and wisely used.

In Hawaii continued economic prosperity depends in an unusually intimate way on the right use of natural resources. For this reason it was especially appropriate that Governor Frear should appoint, as he did in July last, the Territorial Conservation Commission of Hawaii. In personnel the Commission is representative of the interests involved. The chairman is Mr. Ralph S. Hosmer, the Territorial Forester. Mr. W. O. Smith is the secretary of the Hawaiian Sugar Planters' Association, made up of the plantations that are now the largest users of water in the Territory. Mr. Alonzo Gartley is manager of the Hawaiian Electric Company, a corporation that takes a keen interest in harnessing water to do work in another way. Mr. W. F. Dillingham, treasurer of the Oahu Railway & Land Company, represents

transportation interests, and Mr. Jared G. Smith, late director of the Hawaii Experiment Station and now manager of the Kona Tobacco Company, has long been regarded as the special exponent of diversified industries. The three first named accompanied Governor Frear to the Conference of the Governors in Washington in May, as his "advisers."

The Territorial Conservation Commission of Hawaii made its preliminary report to Governor Frear just prior to his departure for Washington in November. It is appropriate that the report should be given in full in the Forester. Therefore it needs no excuse that a good part of this issue is devoted to the report and its appendices. The present report is preliminary. It is expected that further facts and figures will be submitted to the Governor early in 1909, before the coming session of the Territorial Legislature.

To this end the Commission is continuing to collect data on various points bearing on the recommendations made. These with the report will be made public in due course.

PROCEEDINGS OF THE GOVERNORS' CONFERENCE.

A full report of the proceedings of the Conference of the Governors was published in the June number of "Forestry and Irrigation," now known as "Conservation," the monthly magazine of the American Forestry Association.

The Superintendent of Forestry has a limited number of copies of this issue for free distribution. Applications should be addressed to Box 331, Honolulu, Oahu.

VENEER WASTE.

In the veneer industry it is anticipated, in spite of the costliness of many of the woods, that great economies can be practised. Most veneer is made by the rotary cut, by which process logs are steamed until soft enough when they are fixed to a kind of lathe and turned against a wood knife. The latter peels off a continuous slice, much as an apple is peeled, each turn going deeper and deeper till only a core is left.

The 1907 vanilla crop of the Seychelles Islands was a record one. It reached 1,460,932 lbs., and was valued at £66,460. The price obtained for the product was also good, being about 10s. per lb., as compared with 4s. per lb., the average price last year.—Annual Report, 1907.

HAWAIIAN RUBBER GROWERS' ASSOCIATION ANNUAL MEETING.

An unusual demand upon the space of this, the last issue of the year, prevents alluding at length to one of the most important events of the agricultural year. We allude to the second annual meeting of the Hawaiian Rubber Growers' Association, which took place in Honolulu on November 20th. The whole of the day was occupied by the proceedings of the society. Some of the most important papers presented on that date are included in this issue—the extended report of Mr. F. T. P. Waterhouse having appeared in the November Forester.

Probably the most gratifying feature of the whole meeting, and the one which acted as the key-note of the whole transactions was the fact that the production of rubber upon a financial and profitable basis has been demonstrated to be practical in Hawaii. Hitherto it had been known that rubber trees grew well in the islands and that good quality of latex was yielded, but not until now have those who have been endeavoring to establish the new industry received the assurance that their efforts will achieve the success they so much deserve. With the industry established upon a profitable basis and offering a definite return from investment, the immediate future will no doubt witness a great increase in the number of rubber plantations throughout the islands. Already about twelve hundred acres are devoted to this use, and from all sides reports of excellent progress are made. Not only rubber growers but many others who are in a position to judge of the importance of the new undertaking, are confident that rubber bids fair in a very few years to take a foremost place among the staple resources of the Territory.

The morning's transactions were occupied by the reports of Mr. D. C. Lindsay, president of the Association, and of Mr. R. S. Hosmer, Superintendent of Forestry, both of which are presented in this number. Mr. F. T. P. Waterhouse's article on the cultivation of Rubber in Ceylon, Malaya and Java, published in brochure form, was then distributed to the members and the writer entered into more detailed descriptions of its numerous illustrations and added further information relative to his late extended visit to the East Indies.

At the afternoon session the following officers for the ensuing year were elected: Dr. E. C. Waterhouse, president; H. A. Baldwin, vice-president; D. C. Lindsay, secretary and treasurer; Hugh Howell and F. L. Waldron, trustees.

A paper was then read by Mr. G. R. Ewart upon the cultivation of rubber in Mexico. Dr. Wilcox of the Hawaii Experiment Station now presented the results of the tapping experiments which have lately been conducted upon various plantations throughout the islands. This paper, which is given in this number, although occupying small space, contains data of the utmost importance to the industry, and gives it the assurance of success.

Dr. Waterhouse here read a paper upon new species of Manihot rubber tree, which have attracted considerable attention since their discovery. A few specimens of these trees are now growing in the islands and their development is being watched with great interest.

Messrs. C. J. Austin of the Nahiku Rubber Company and C. O. Jacob of Nahiku spoke of the work of the past season and the results of their experience upon various phases of cultivation.

The day's proceedings terminated with a banquet at the Alexander Young Hotel, at which several excellent addresses were delivered. Judge S. B. Dole described the difficulties which in the past had been encountered by the pioneers of other industries in the islands. With regard to the rubber industry Judge Dole spoke of its advantage in being one in which the small land owner might venture as although to produce it requires skill, its manufacture is not dependable upon expensive machinery. He looked to such industries as rubber, tobacco and pineapples to bring to our islands a people of intelligence and enterprise who would effect much for the financial, social and political development of the Territory.

Mr. B. F. Dillingham then spoke effectively of the difficulties which all new enterprises encounter and must overcome, before they become established. However, frequently the difficulties are enough to discourage the most sanguine. The speaker would say a word of encouragement to such, for he too had hard doubts and fears and many sleepless hours of apprehension which had been dissipated in the sunshine of hope and anticipation. Mr. Dillingham believed that rubber would become even what the most sanguine of those present hoped. He had noticed that whatever industries were suited to our conditions produced results not only equal to those of other countries, but even a little better. This is true of our sisal, which commands a higher price than that of any other country. It is true of our pineapples, for nowhere in the world is such delicious fruit produced as in these islands. It is also true of our oranges, and connoisseurs have pronounced those grown in Hawaii to be second to none. He would particularly urge upon all those present, who were of an age to profit by his advice to plant orange trees in their home gardens. He believed that the time was near when Hawaii would be unable to supply the demands of her population on account of lack of forethought of agriculturists.

Mr. W. O. Smith then made an excellent address upon the necessity of increasing the agricultural industries of the islands. He reminded his hearers that even the sugar industry had had its reverses, and had only survived by dint of perseverance. The speaker insisted that the logical crops for Hawaii to produce were those which have a world's market. Rubber is an article the area of whose production is limited, but which has the whole world as its potential consumer. In this he viewed the greatest opportunity and earnest of success of the new industry.

HAWAIIAN RUBBER GROWERS' ASSOCIATION.

Address by the President.

Honolulu, November 18th, 1908.

To the Members of the Hawaiian Rubber Growers' Association:

Gentlemen:—On behalf of the officers of your Association, I beg to extend to you a hearty welcome to this our second convention.

This Association as you probably know was formed on Maui in the month of June, 1907. A convention was held in October of last year at Nahiku where by-laws were adopted and routine business transacted, and this year your executive committee deemed it best to name Honolulu as the meeting place.

The primary objects of this Association are to foster and safeguard the interests of the rubber industry of these Islands; to secure, if possible, Federal and Territorial aid in solving the problems that naturally arise in a new industry and to bind the various companies together for mutual improvement and protection.

Just what the scope of this organization will be, has not yet been determined. It may be wise at some time in the future to vest it with power to levy assessments on the different plantations, should it be found necessary to raise any considerable fund, but at present no great expenditure seems necessary and small assessments on the individual members will probably meet all requirements. Your executive committee levied a $1.00 assessment recently. This action was necessary owing to the fact the Territorial Board of Agriculture did not see its way to pay the full cost of publication of the report of Fred T. P. Waterhouse, on his recent trip to various rubber growing countries, together with the cuts of the numerous photographs. Your committee deemed it necessary that these cuts should be published, thereby greatly enhancing the value of the report, and made an arrangement with the Board of Agriculture to pay one-third of the cost of publication with the condition that a certain portion of the issue be set aside for the use and benefit of this Association. This report is now before you and we trust you will find therein much interesting data and comment and also derive therefrom comfort in the fact that, taken as a whole, the growth of the rubber trees in Hawaii compares very favorably with that of other countries where rubber is now grown on a highly profitable basis.

We have also this year, through the good offices of Dr. Wilcox and Mr. R. A. Hosmer, been able to secure assistance from the Federal and Territorial Stations to conduct a series of practical experiments, relative to tapping of trees and coagulation of latex. These experiments are now being carried on at Nahiku by

Mr. Bradford under the direction of the above named two gentlemen. They will, doubtless, be further explained later in the meeting and some statistics relative thereto may be given out today. The figures derived from these experiments will have a very important bearing on the future of the rubber industry of Hawaii and we hope that when they are completed, a bulletin will be published for the benefit of our members. Dr. Wilcox has also assured us that the staff of the chemical laboratory of the United States Experiment Station will make any necessary analyses and help us in every possible way to solve the problems that are sure to arise within the next year or two. Such assistance will be invaluable to us and we ought to express our thanks to Dr. Wilcox and Mr. Hosmer for the kindly interest they have taken in, and the help they have given to, this infant industry.

During the last year, the price of commercial rubber reached the lowest point it has touched for many years. This was due mainly to the depression in the United States; the demand failing to keep pace with the supply. For the last few months, however, the price has been steadily rising and there seems to be very little cause for serious apprehension from that source.

The labor situation in the Islands is one that must necessarily be given consideration by this Association in the future. At present the rubber industry requires comparatively few laborers, but when the present plantations reach the productive stage, quite a number will be required and it will only be just and equable that this industry should work in harmony with the others who are expending large sums in securing an adequate labor supply.

The next few years will be the most important and critical ones in the development of this industry and I would suggest to the members of this Association that they see to it that the very best men possible be placed on the executive committee of this organization as that committee will necessarily be an important factor in bringing to a successful issue one of the most promising of the diversified industries of Hawaii.

Respectfully submitted,

D. C. Lindsay,

President of the Hawaiian Rubber Growers' Association.

TREES AS A CROP.

Throughout New England tree planting upon abandoned farms is being undertaken as a profitable industry—this year about 2,500 acres having been planted by private citizens for this purpose.

CEARA RUBBER, 18 MONTHS OLD, ON AN OLAA PLANTATION HOMESTEAD, OLAA, HAWAII.

THE HARVESTING OF RUBBER IN HAWAII.

AN OUTLINE OF A CO-OPERATIVE EXPERIMENT.

By Ralph S. Hosmer, *Superintendent of Forestry.*

[Read at the second annual meeting of the Hawaiian Rubber Growers' Association, Honolulu, Hawaii, Nov. 18, 1908.]

The object of this paper is briefly to describe the coöperative investigation recently undertaken by the Hawaii Experiment Station, the four rubber plantations at Nahiku, Maui, and the Division of Forestry of the Territorial Board of Agriculture and Forestry, to determine the best method of harvesting rubber in Hawaii.

By way of preface it may be recalled that in the summer of 1906 during an examination of the planted forest at Lihue, Kauai, made by Mr. C. S. Judd, then an agent of the Division of Forestry, there was brought to public attention the existence of two

THE ORIGINAL CEARA RUBBER TREES PLANTED BY HUGH HOWELL, NAHIKU, MAUI. THE YIELD OF THESE TREES WAS SO HIGH THAT UPON THE FAITH THEREOF ALL THE RUBBER PLANTATIONS IN THE ISLANDS WERE PLANTED.

groves of Ceara rubber trees at Lihue and at Koloa, Kauai. As the trees were large enough to be tapped these groves presented an opportunity for securing data as to methods of tapping and other facts and figures of value to the rubber industry. Accordingly arrangements were at once made with both the Lihue and the Koloa Plantation Companies to permit systematic tapping tests to be undertaken. At first it was planned that the Division of Forestry should carry on the work, but as the Hawaii Experiment Station had a man available, which the Division of Forestry then did not, it was decided by the Board that it was best that the Experiment Station undertake the investigation. The field work was carried on by Mr. Q. Q. Bradford under the direction and supervision of Mr. Jared G. Smith, then Director of the Station, and much valuable informaation was collected. The results of the investigation have been published recently as Bulletin No. 16 of the Hawaii Experiment Station—an important contribution to our knowledge of rubber in Hawaii.

Necessarily one investigator working with only limited means cannot be expected to answer all the questions that arise in so large a field as is the study of rubber production in Hawaii. At the beginning of this last summer it became apparent that further study on the ground was urgently required, particularly in the way of getting together exact figures on the cost of tapping the trees and attending to the other details necessary in transforming the latex into a marketable product.

To meet this need I proposed to Dr. E. V. Wilcox, the present Director of the Hawaii Experiment Station, soon after his arrival in Hawaii in July last, that such an investigation be undertaken jointly by his Station and by the Division of Forestry; the Experiment Station to furnish the man to do the work, the Division of Forestry to supply the necessary funds for salary and expenses. This plan met with Dr. Wilcox's hearty approval and later, with that of the representatives of the four rubber plantations at Nahiku.

From the start the experiment has been planned with special reference to securing figures that shall have direct practical bearing on the commercial development of the rubber industry. To attain this result there was kept constantly in mind in planning the tapping tests the conditions that the rubber plantation manager must face daily in actual practice. To this end it was arranged that there should first be tried only the simplest possible methods of tapping, such as any laborer of ordinary intelligence could learn to do, and that all refinements of process be at the start done away with. It was further provided that any given tapping test should be made on a large enough number of trees to be really representative and that each such test should be continued as long as the size of the trees warranted. Another provision of the same order was that an accurate record be kept of the time of all laborers employed, in units of not less than one-half of an actual work-

ing day—the experiments being so planned as to keep the men busy during that time.

The two important points on which the success of the rubber industry in Hawaii turns are first, whether the trees yield latex in commercial quantities, and second, whether the latex can be collected and prepared for market at a profit. Until these questions are definitely answered the rubber industry must remain in

CEARA RUBBER TREE AT OLAA MILL, PUNA, HAWAII.

the experimental stage. From the tappings of larger trees that have so far been made in Hawaii there is every reason to be sanguine over the flow of latex. The present investigation should go a long way toward throwing light on the cost of handling the product, for the figures that are being collected refer not alone to the tapping of the trees but include as well the several steps of collecting the rubber from the trees, getting it to the drying house, making it into a commercial product and preparing it for shipment.

Incidentally much information will be got on the quantity of latex found in young trees, and the age and size at which tapping should best be begun. Such data are all to the good for the object of the experiment is not to get rubber, but to find out accurately what the cost of collecting it is to be. Even if no rubber at all were obtained the data as to the time needed for making the cuts, setting and gathering the cups, carrying the containers to the drying shed and the rest would be distinctly worth while, for at present there are no figures available on the cost of these operations.

It perhaps should be said here that along with the tapping tests on the small trees there will also be made continued tappings of some of the older trees to ascertain how much rubber can be produced and for how long a time it is expedient to continue to tap a given tree.

In working out the details of the experiment the plan broadened somewhat in scope so that as it now stands the work that it is proposed to do falls under four main heads, as follows:

First. Experimental tappings to determine the cost of collecting latex under conditions of commercial practice.

Second. Comparative tests of different methods of tapping to ascertain which one is best adapted to the local conditions, in view of cost, time required, effect on the flow of latex, and general influence on the tree.

Third. A study of the methods of handling latex after it has been collected, with special reference to control by chemicals or by other means, so that as large a percentage as possible may be sold as high grade rubber. The best way of handling the "scrappings" is an important phase of this problem.

Fourth. A study of methods of cultivation and fertilization, to find out how through these means the rubber trees may be brought sooner to the point of tapping, or by increased vitality be made to yield larger quantities of latex at an earlier age or for a longer period of flow.

Along with the main points enumerated much information should also be got on such related matters as the best spacing of the trees, the appropriate season of the year for planting, intercultural crops, and the like.

The work under the third head, methods of chemical control, will be performed at the laboratory of the Hawaii Experiment

Station in Honolulu as it is of a character requiring special equipment and knowledge only possessed by a trained chemist. There are enough rubber trees on the station grounds and in the Tantalus forest to provide the necessary latex. All the rest of the work will be done in the field on the several rubber plantations.

Of what has so far been accomplished in these experiments Dr. Wilcox is to speak this afternoon.

CEARA RUBBER, EIGHT MONTHS OLD, ON AN OLAA PLANTATION HOMESTEAD.

The terms of the coöperative agreement as it now stands are that the Hawaii Experiment Station shall furnish the agent in charge of the field work and shall undertake the chemical and other studies requiring laboratory equipment; the Division of Forestry pays the salary of the agent and the other necessary expenses. For this purpose $1200 has been set apart from the appropriation of the Division. Each of the four rubber plantations at Nahiku has agreed to furnish one laborer for such time as may be needed, to work under the direction of the agent in charge but to be paid by the plantation.

Early in September Dr. Wilcox, Mr. F. T. P. Waterhouse and I visited Nahiku and worked out on the ground, in conference with the managers of the four rubber plantations the program that has since been put in effect. The investigation will be continued during the remainder of the present fiscal period, that is to June 30th, 1909. At its conclusion the results will be published either by the Experiment Station or by the Board of Agriculture and Forestry.

HAWAIIAN IMPORTS.

The following statistics of imported goods, which should be produced in the islands, gives ample support for the contention that the appointment of a local industrial agent to organize the sources of supply of the Territory and bring them into touch with the market, is of great and immediate importance:

Article Imported	Value 1906	Value 1907
Potatoes	$ 56,464	$ 87,536
Onions	17,007	18,865
Corn	46,619	41,690
Beans	76,180	66,394
Vegetables	58,349	34,791
Eggs	12,995	14,943
Poultry	21,431	30,032
Hams	46,271	59,659
Bacon	10,663	11,731
Butter	116,714	130,015
Cheese	31,512	31,429
Milk	95,152	147,619
Oranges	41,034	46,228
Apples	29,108	39,467
Other fruit	28,600	35,109
Rice	449,046	573,516
Sauces and pickles in natural state and prepared	210,728	218,513
Totals	$1,377,873	$1,587,237

EXPERIMENTS IN TAPPING CEARA RUBBER TREES.

Address by Dr. Wilcox at the Hawaiian Rubber Growers' Association Second Annual Meeting.

Dictated after the meeting.

The rubber experiments which are being carried on by the U. S. Experiment Station and Territorial Board of Agriculture and Forestry have been under way long enough to indicate certain results which are of practical importance to rubber growers. Thus far more than 200 trees, most of them less than three years old, have been tapped. These trees averaged from twelve to thirteen inches in circumference and were located chiefly on the grounds of the Koolau Rubber Company, on Maui. In tapping young trees it was not expected that profitable returns of rubber would be obtained; but the plan involved the practical point of determining the rapidity with which trees could be tapped, and satisfactory methods of handling labor to the best advantage. In the first series of 80 trees, which were tapped by means of one vertical cut each day, it required thirty-six hours and forty minutes of labor to tap the trees, collect the latex, and secure 1½ pounds of dry rubber. In the second series of experiments on 160 trees, which were tapped with two vertical cuts instead of one, it required only 40 hours of labor to tap the trees, collect the latex and obtain five pounds of first class rubber and about a pound of scrap rubber. In this experiment in which two vertical cuts were used daily, profitable returns were obtained.

It was found that an ordinary laborer could tap rubber trees, by means of two long, vertical cuts, at the rate of about 50 trees an hour and could collect latex at the rate of 100 trees an hour. The available labor on plantations appears to be reasonably effective in doing this work, and the amount of training required in order to make the cuts effectively and quickly is not excessive.

It requires less time to tap older trees than the young trees, upon which our work is done, and there is also less danger of injuring the trees. We have found that a good flow of latex can be obtained from tapping done from daylight until 8 a. m., or even later.

From the experiments which we have thus far conducted it appears that one man can tap about fifty trees per hour, while another man can collect the latex from the trees which would be tapped in the same time by two men. Since it appears from results which we have obtained from tapping mature Ceara rubber trees, that about one-third ounce of dry rubber may be expected as a daily yield, it is evident that three men should be able to obtain rubber from mature trees at the rate of about one pound per hour. The data upon which this conclusion is based have been carefully considered and the estimate is probably not above

CEARA RUBBER ABOUT EIGHT YEARS OLD ON THE PREMISES OF A. G. CURTIS, OLAA, HAWAII.

what may be expected. At any rate, the results obtained in our experiments indicate clearly that the Ceara rubber tree in Hawaii will not only grow and thrive, but will yield profitable returns.

Further experiments will be carried on in the microscopic examination of sections of the Ceara rubber tree to get a basis for determining the best method of tapping. Several other species of rubber trees will also be tapped and an elaborate series of fertilizer experiments with rubber is planned. We hope to be able to devise a method of fertilizing rubber trees so as to secure an increased flow of latex during the tapping periods.

A NEW USE FOR RUBBER.

An ingenious device has been patented by a Japanese, Kozaburo Makimora, for the automatic signalling of shallow water. It consists briefly of an airtight rubber disc covering one end of an empty cylinder. This cylinder is weighted and towed by the ship at the end of a small armored electric cable. The rubber is bulged in by the pressure of the water, but this is partly compensated for by the provision of a spiral spring inside the cylinder. When the ship approaches shallow water the apparatus drags along the sea bottom, and as the water pressure lessens, the balance between the force of the spiral spring pushing outwards and the force of the water pushing the rubber disc inwards becomes disturbed, and acting upon a simple mechanism, rings an electric bell upon the ship. The rubber disc is well protected by a perforated cap.

We are not sufficiently informed to say for certain whether the device is entirely practicable for merchant vessels steaming at considerable speed, but at any rate there should be a considerable scope for the invention upon survey vessels, ships in unknown waters, etc.—*India Rubber Journal,* April 20.

LUMBER IMPORTATIONS.

The lumber importations of the world amount to $285,600,000, of which in spite of the fact that its supply is diminishing, the United States furnishes 20 per cent.

Only four per cent. of Great Britain is forested, while Germany possesses still 26 per cent. of forest land. The countries importing most wood are, generally speaking, those on the highest economic plane, which were formerly densely wooded, but whose forests have been destroyed.

THE NEW MANIHOTS.

By Dr. E. C. Waterhouse.

During the last two years and especially this year great interest has been aroused in some new species of Manihot rubber trees which from all accounts are far superior to Manihot glaziovii and which should be of especial interest to the rubber growers of Hawaii from the fact that the Manihot glaziovii or Ceara rubber tree grows and yields so well in Hawaii. Some of the reasons why, if these species do as well as the Ceara, it will be well worth the while of the rubber growers of Hawaii to pay particular attention to these species in future plantings, will be forthcoming later in this paper.

The export of rubber from the State of Babia has increased more than tenfold within six years, having risen from one hundred tons in 1900 of very inferior rubber to over 1,100 tons in 1906 of a very superior grade of rubber. This lead to an investigation of the sources of this new supply and the discovery that instead of the low grade of Mangebeira as formerly gathered, the supply came mainly from three new and very valuable varieties:

1. Manihot dichotoma or Jiquié Manicoba;
2. Manihot heptaphylla or Sao Francisco Manicoba;
3. Manihot piauhyensis or Piauhy Manicoba.

These varieties were so named by Dr. Ule, so well known as an authority on the classification of different species of rubber trees and who visited the State of Bahia and neighboring states in 1906 to look into the sources of this supply.

Until six years ago Manihot glaziovii was considered the only rubber yielding species of its genus (though there are 82 species recorded which will soon be 100 when all those discovered are described). It was only in the early part of 1906 that even the Kew Gardens, the birth place, so to speak, of the rubber industry in the far East and always on the lookout for new species of rubber, was aware of the existence of rubber yielding trees closely related to the commonly cultivated Manihot glaziovii.

All these species, from all accounts, not only yield considerably more latex than the Ceara but what is of very much more importance to Hawaii is, the amount which one man can collect is much greater (in other words the cost of collection is considerably less). This is a most important item here owing to the high price paid for labor and in fact the point upon which the whole success of the rubber industry in Hawaii hinges.

A notable fact in this connection, one which will appeal to any one who has had any experience in tapping the Ceara is that in these new varieties, in shedding the bark, longitudinal slits are formed and the membranous bark peels off in more or less vertical rows. This allows its removal much more easily and therefore cheaply, than is the case with the Ceara.

These varieties of Manihot like the Manihot glaziovii or Ceara

have a very dry habitat. However, just as we find here in Hawaii that the Ceara does better in wet localities, so with these varieties the same may be true. That the Ceara does better here where it is wet I think there is no doubt. I have myself in a little experiment station of my own tried watering some plants and leaving others in the same soil unwatered, and the watered plants far outstripped those unwatered and seemed to have as much or more latex, though the trees are still too young to draw conclusions from as to yield.

In regard to these three varieties:

(1) MANIHOT DICHOTOMA.

The seeds of this variety are much larger than those of the Ceara. Germination takes place in two to three weeks if unfiled, the shell being much softer than in the case of the Ceara. The soil upon which this tree flourishes is variously described as red clay and red loam. The bark of this tree is thinner and more delicate than that of the Ceara.

(2) AND (3) MANIHOT HEPTAPHYLLA AND MANIHOT PIAUHYENSIS.

The seeds of these two varieties can hardly be distinguished from each other; they are only a little larger than Ceara seeds. They do not germinate nearly as well as in the case of the Manihot dichotoma. These two varieties in the region around Bahia thrive in a sandy soil, growing largely on sandstone mountains. Both varieties do not grow as tall and are smaller than the Manihot dichotoma and inclined to branch low. They are not affected by the wind so much as Ceara, probably on account of being smaller and more low lying. This also affects the methods of tapping as explained later. The foliage is characteristically green and fresh looking.

Methods of Planting.—There are a number of plantations around Bahia, some of which are now three or four years old. They are planted for the most part 1000 trees to the acre. This close planting has been adopted because the trees are planted in a dry locality and it is claimed that if not planted so closely, or say 200 to the acre, the ground would be baked so hard and dry that the trees would dwindle and die. Also the trees are considerably smaller than other varieties and consequently need less room.

Methods of Tapping.—In the case of the Manihot dichotoma the bark of the trunk is tapped and an instrument curved at the tip is used. The herring bone or a single cut is used. Cups are used to receive the latex. The latex coagulates quickly on exposure to air but apparently not too quickly to prevent its flowing down into the cups well. Water is sometimes used in the cups to prevent too rapid coagulation.

In the case of the Manihot piauhyensis and Manihot hepta-

phylla the shorter trunk and somewhat thinner bark than the Manihot dichotoma are not suitable for cutting and by this method yield little latex. A little earth, however, is scraped away from the base of the tree and the top of the taproot is exposed and an incision with a round pointed knife is made at or near the junction of tap root and trunk, and the latex flowing into this hole coagulates and is gathered therefrom. Often the collectors coat this little hole with clay to keep the rubber cleaner. Cups have been used but there is some difficulty in getting them into the hole thus made and the method is little used at present in collecting from the wild trees, but will doubtless be worked out on plantations.

Yield of the Trees.—This is variously stated all the way from 2½ to 11 pounds per year. Though of course these statements are made in regard to the gathering of the rubber from wild trees which are more or less ruthlessly tapped and especially in the case of the Manihot dichotoma the wood is thus often injured severely and the tree dies. Also it is probably wet rubber that is spoken of and also in some of it, especially the Manihot heptaphylla and pyauhyensis, there may be considerable dirt.

Dr. Ule considers that the Manihot dichotoma has the advantage of its caoutchouc, fetching a somewhat higher price. On the other hand the amount produced in the other varieties is considerably greater according to him. He therefore prefers these latter varieties, which he considers will supplant the Ceara for the dry and less fertile areas where Ceara is cultivated. There is no doubt, however, that all of these varieties yield more than the Ceara.

Amount of Latex Collected by One Man in One Day.—This has been variously stated at from 1 to 8 or 10 pounds. Taking into consideration the tendency to exaggeration in regard to any new product and misleading methods of figuring, still it is generally conceded that considerably more can be collected in a day from these varieties than from the Ceara.

Several thousand seeds of the Manihot dichotoma or Jiquié Manicoba were imported by Mr. Jared Smith and most of the rubber plantations have obtained some of these. I have planted a few of these seeds. When filed they germinated in a few days and have grown very well, fully as well as the Ceara so far, in spite of the fact that this is the wrong season of the year for planting. The leaves have red ribs especially when looking up through the leaves with the sunlight shining through. Those obtained at the Kew Gardens had whitish green ribs which it has been suggested might be due to artificial cultivation there or may mean two such varieties have been described. Both are of about the same value however. I intend to try watering some of these trees very heavily and letting others have only the rainfall which if this dry weather keeps up will be a slight test as to whether it will thrive best in a dry or wet locality here in the Islands.

So far I have watered all the young seedlings and they have

done very well. Seeds of this variety are the only ones so far obtained. But it is doing very well when we remember that not even the Kew Gardens nor the Gardens in Ceylon, Singapore, etc., have been able to obtain these other two varieties, though they have been seeking to do so for two years. The Peradeneya Gardens of Ceylon have 100 seedlings of Manihot Dichotoma growing, also the Singapore and Penang Botanic Gardens. The Peradeneya Gardens are constantly asked for seed, they cannot as yet supply for planting in the dry lands in Ceylon where the Hevea can not be grown. We must not, however, forget that the rest of the tropical world always thinks of these varieties as well as the Ceara in connection with a dry region and it was only because we found trees of the Ceara variety growing and yielding so well in our wetest localities, as in Nahiku and Puna, and so much better than in the dryer localities, as in and around Honolulu, etc., that we decided, what subsequent plantings have all tended to confirm, that the weter localities, if not too cold, are better for the Ceara than the dryer ones here in the Hawaiian Islands. Still it would be a wise thing to plant some of these Manihot dichotoma in some dry places for experiment. Dr. Ule says:

"If, as is probable, the cultivation of Hevia braziliensis will undoubtedly obtain the greatest importance for the production of rubber in luxuriant tropical regions, the future has to look to Manihot heptaphylla and Manihot piaunyensis as the rubber plants for the dry and less fertile areas." Of course, it is only fair to say that other observers speak as highly of Manihot dichotoma, which he has left out in this statement.

To sum up then there are several reasons why the planters of Hawaii should direct their attention to these varieties.

1. In the first place the industry in these Islands is in its infancy and we should endeavor to test all the different varieties of rubber yielding trees which seem to promise well. For we do not yet know which species will prove the best in the long run all things considered such as early yield, cheapness of installation, length of yield with constant tapping, amount of yield, cheapness of collection, quality of the rubber obtained, etc., etc., a balancing of all of which will give us finally the best species to cultivate most largely. The present plantations must necessarily do a great deal of pioneer work in this regard, if we have regard to the industry for the Islands as a whole. After the present companies have shown what can or can not be done commercially with the different species no doubt many plantations will follow this lead.

2. These varieties in their habitat yield considerably larger quantities than the Ceara and yet thrive under very much similar conditions to those in which the Ceara thrives, the variety which so far has proved to grow the best here.

3. Most important of all, here are varieties which promise the lowest cost of collection which, quality being equal, is as I have said the pivotal point in regard to the whole industry in Hawaii.

MAGNETIC OXIDE OF IRON IN HAWAIIAN SOILS.

W. P. Kelley, *Chemist Hawaii Agricultural Experiment Station.*

For many years it has been a matter of common knowledge among surveyors on the Hawaiian Islands that readings of the magnetic compass are often very misleading. In the Coast and Geodetic Survey of the islands abnormal deflections of the magnetic needle occasion much comment by those in charge, and numerous discrepancies concerning boundary lines in the interior have been traced in a large measure to inaccuracies of the compass. By reference to old land maps it is apparent that conflicting land claims exist; and so well established is the fact of magnetic deflection here that surveyors no longer rely on the compass in survey work. It is further stated that such magnetic disturbance is by no means confined to land, as pilots on board ships frequently observe peculiar deviations of the compass when sailing close to these shores.

The cause of this phenomenon has generally been attributed to the presence of metallic iron in the enormous rock beds and lava flows of the islands. This view would seem to have more or less basis since Hawaiian lavas in general contain much iron, and since magnetic deflection is usually greatest in the vicinity of large masses of lava or near hill and mountain sides. In passing around certain masses of lava on Hawaii, for instance, the magnetic needle is said to be deflected through an arc of 360 degrees.

In the course of some investigations at the U. S. Experiment Station it was found that the large deposits of black sand on the reservation possess magnetic property to a marked degree and subsequently it has been shown that the soil not only on the station grounds but throughout the islands is magnetic A small horseshoe magnet almost universally attracts particles from both surface soil and sub-soil. Experiments have been made to determine what substance in the soil is thus attracted by the magnet and as an outcome of this investigation it has been found to be one of the oxides of iron, namely: $Fe_3\ O_4$, the so-called magnetic oxide of iron or magnetite, and not metallic iron in the uncombined state. This compound of iron has long been known to be highly magnetic and is a constituent of most volcanic rocks. It is reported by Dr. Hilgard as being generally distributed in the black sands and alluvial soils of the Pacific Coast, also as occurring in Hawaiian lavas, though no mention is made of its occurrence in the soils of Hawaii. Magnetite occurs scattered throughout the Rocky Mountains and is found in enormous deposits in Northern Pennsylvania, New Jersey and New York where it is mined as one of the richest iron ores in America.

From preliminary investigations magnetite appears to be uniformly distributed throughout a large part of the rocks of Hawaii,

appearing, however, in an amorphous state, no crystalline form having yet been observed. In the breaking down of primary lava, magnetite is detached along with other substances and whether it be transported by various agencies or left in place, the soil arising from such lava usually contains magnetic oxide of iron. It is usually possible to make a separation of magnetite from other materials by the use of the magnet; but this separation, however, seems almost impossible with Hawaiian soils or lava since the magnetite is so completely disseminated throughout the various deposits here and has not become crystallized out or separated from the matrix in which it was erupted. Whatever economic bearing this substance has on agriculture remains to be determined. The oxide as such is of little importance to agriculture, though some of its compounds impart characteristic properties to the soil. The blueish color of certain newly plowed lands in various places on Oahu indicates the presence of a hydrate of this oxide, the ferroso-ferric hydrate which in turn under certain conditions may give rise to a substance that is injurious to plant growth.

NEW FARMERS' BULLETINS.

Nuts and Their Uses as Food. By M. E. Jaffa, Professor of Nutrition, University of California. Prepared under the supervision of the Office of Experiment Stations. Pp. 28, fig. 1. (Farmers' Bulletin 332.)

This bulletin is a revision and extension of an article in the Yearbook of the Department for 1906, and embraces a description of several varieties of nuts, with statements as to their flavor, composition, digestibility, value as food, etc., with remarks on nut products, and suggestions for handling and marketing.

Experiment Station Work, XLVIII. Compiled from the Publications of the Agricultural Experiment Stations. Pp. 32, figs. 2. (Farmers' Bulletin 334.)

Contents: Plant breeding on the farm—Sorghum for silage—Dry rot of corn—Starch from sweet potatoes—Profits from tomato growing—The keeping of apples—Weed seeds in manure—Weed seeds in feeding stuffs—Forage crops for pigs—Market classes and grades of horses and mules—Profitable and unprofitable cows—Blackhead in turkeys—Extraction of beeswax—An improved hog cot.

Macadam Roads. By Austin B. Fletcher, Special Agent, Office of Public Roads. Pp. 39, figs. 10. (Farmers' Bulletin 338.)

This bulletin is a revision of Bulletin 29 of the Office of Public Roads, and contains detailed information in regard to the construction, maintenance and cost of Macadam roads, the kind and quality of stone, tools and machinery, labor and teams, etc., with an appendix containing excerpts from specifications used in the construction of State-aid roads in Massachusetts.

BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

Division of Entomology.

Honolulu, Hawaii, November 1, 1908.

Honorable Board of Commissioners of
Agriculture and Forestry of the
Territory of Hawaii.

Gentlemen:—Following is my report for the month of October.

INSPECTION.

We boarded 21 vessels and found matter subject to our inspection on 15 of them. The disposal made of the cargo is shown in the following

TABLE OF INSPECTION.

LOTS	PARCELS	DISPOSAL WITH PRINCIPAL CAUSES.
543	16,658	Passed as free from pests.
14	75	Treated before releasing owing to scale bugs principally.
20	39	Burned. 22 of these were turnips, infested with cabbage maggot and covered with soil. The balance were wormy fruit and scaly fruit.
577	16,772	Total inspected.

HILO INSPECTION.

Bro. Matthias reports from Hilo having inspected 1851 parcels in all. Of these, a small lot of oranges he threw overboard because of bad condition. Destroyed the cases and wrappers of two lots of plants that passed muster otherwise.

POSSIBLE PESTS INTERCEPTED AND DESTROYED.

Turnips.—Every lot of this vegetable imported during the month was found dirty and wormy. As the pest is not yet recorded from the Territory we are anxious to keep it out and there-

fore consigned to the flames all the 22 parcels that came. We are firmly determined to admit none but absolutely clean turnips.

Greedy Scale.—This pest has made six attempts to enter the Territory during October, but was foiled each time by fumigation of 42 parcels and burning of another of the fruit upon which it was stealing the ride.

Chestnut Weevil.—By courtesy of a customs official our attention was brought to a lot of 10 cases of chestnuts consigned to a Japanese firm that was heavily infested with the grubs of a chestnut weevil. When the manager of the firm was informed that some action would have to be taken he readily consented to carry out whatever instructions we may issue. After some deliberation it was decided that thorough boiling in hot water would destroy the weevils and save the edible portion of the fruit to the owner. In our presence this was carried out the next day.

Other Possible Pests.—By means of fumigation and flame we also blocked the way at the point of entry to the following: Weevil (Curculionid) on ginseng; borers on orchids; scale bugs, centipede and roaches on another lot of orchids, and Coleopterous borer in herbs from the Orient; 7 species of scale bugs (red, yellow, San Jose, cottony cushion, lecanium and 2 species of snow scale (Chionaspis)) and one of white-fly (on cut flowers) from the Coast.

Pineapple Quarantine.—The Board regulations, as they at present stand, prohibit entirely the importation of pineapple plants from Australia. But pineapple growers and others interested expressed eagerness to import new varieties, since at the time the bars were raised, there was practically but one variety in the country. The question was brought to a focus when a citizen made application for permission to import plants of the rough-leaf variety from Australia. Your president referred the matter to me for consultation with plant pathologists, since the prohibiting regulation was passed in order to prevent the possible importation of fungus disease. After consulting both Mr. Lewton-Brain and Dr. Wilcox as well as a prominent pineapple grower I reached the conclusion that it is desirable to introduce new varieties of the plant, that the prohibitive measure is no longer tenable in view of the quarantine facilities of the U. S. Experiment Station kindly placed at our disposal by Dr. E. V. Wilcox, and our own improved facilities for fumigation and disinfection of such imports. In view of these circumstances I addressed your president presenting these facts to his consideration and advising a modification of the regulation of pineapple plant importation in accordance with these facts.

OTHER INSECT MATTERS.

Beneficial Insects.—After several days collecting we dispatched a large collection of useful insects, principally ladybirds, to Dr. F. Silvestri, the eminent Italian Government Entomologist at

Portici, who visited us recently, then in New York City to take along with him to his native country. To be on terms of exchange of useful insects with as many entomologists of the world as possible is an advantage that may result in untold good any time.

Publication.—General Circular No. 3 covering the law of the last Legislature and the Board regulation based thereon pertaining to the importation and inspection of honey and honey bees was issued on the 8th and given wide circulation among bee culturists and importers.

As is probably known to the Board, by arrangement of your Bee Committee, the work of inspection of bees and honey was delegated to Mr. Van Dine, the Entomologist of the Federal Experiment Station.

Dock Laboratory.—On the 31st of the month we commenced building the laboratory on the Oceanic Dock. This is to be a room 12x16 adjoining our fumigatory there. It will have two windows facing Fort street, or what is left of it by the coal pile, one window onto the dock, and a door for entrance on the Ewa makai corner. Within it we are to have desks, table for work and storage of specimens, stationery, etc., a cupboard to hold chemicals, glassware, etc., and a sink and water tap.

Respectfully submitted,

JACOB KOTINSKY,
Superintendent of Entomology.

HAWAIIAN BANANA POSSIBILITIES.

Last year, from Bluefield, over two million dollars' worth at wholesale of bananas came into Seattle, Portland, Spokane and Vancouver. These bananas were brought to New Orleans on steamers and hauled across the continent and landed for one and a quarter cents a pound, while the rate from Honolulu to Seattle was two cents a pound. Even with this disadvantage, the Hawaiian banana could capture the field on quality alone, while with equal freight rates and an assured steamship service the Hawaiian fruit could drive the Florida fruit and the imported banana out of the market as far East as Winnipeg.—*Byron O. Clarke.*

LOCAL INDUSTRIAL AGENT.

The Hawaii Promotion Committee at a recent meeting decided to recommend the appointment of an industrial agent, under salary from the Chamber of Commerce and Merchants' Association, to work up a local market for the produce raised by island growers. By this means it is hoped to retain in the Territory a part of the large amount of money which is now being sent away to pay for imported stuffs which could well be raised here.

HAWAII.

[A STATEMENT PREPARED FOR PRESENTATION AT THE CONFERENCE OF THE GOVERNORS.]

By Hon. Walter F. Frear, *Governor of Hawaii.*

Even the most far reaching problems may often be illumined and sometimes solved by observation or experiment upon a small scale. The laboratory, by its processes of bringing forces into clear relations, may in a moment disclose principles that centuries of national or world-wide experience have left unsuspected. Little, distant Hawaii, now an integral part of the Union as a full-fledged Territory, has been, ever since the beginning of Christian civilization there less than a century ago, a veritable laboratory of industrial as well as sociological experimentation under conditions that have seemed almost artificial in the clearness of the relations of the operative forces. It may be that she can shed light, at least by way of illustration, upon some of the needs, methods, and means involved in the all-important national questions presented to the Conference.

I will present but two points. The first is the marvelous results of the application of science to agriculture. That has been in large measure the making of Hawaii industrially.

That Territory is a group of lofty islands of recent volcanic origin, within the tropics, remote from the world's markets. Practically without mineral resources, she is dependent mainly upon her soils; but, although nearly as large as Connecticut and Rhode Island combined, so much of her area is so high or so precipitous or so recently formed or so dry or otherwise unsuited to marketable crops that only a very small percentage can be classed as arable in its natural condition and in the present state of knowledge. Obviously, if she is to support a large population, science must do what nature has left undone, and accordingly perhaps nowhere else is science now being more resorted to for agricultural purposes, and yet only a beginning has been made.

The limited extent of arable public land in Hawaii—and comparatively speaking now on the mainland—calls for the greatest care in its disposition. Adequate precautions should be taken to insure its disposition in general only to bona fide settlers and in not larger quantities to each than can be put to best use; and until a superior use can be found for the large areas still held as public land for which no such use is known at present, they should in general be retained or disposed of only temporarily by lease or otherwise, until a superior use is discovered for them. Hawaii's experience in earlier liberal disposition of the lands and later discoveries of superior uses emphasizes the need of such precautions.

Until a few years ago attention in Hawaii was directed almost exclusively to the production of cane sugar, which, in spite of various adverse natural conditions, has been brought by the appli-

cation of science to the highest point of efficiency yet attained anywhere,—so much so indeed, that from her comparatively small acreage of cultivated land Hawaii will produce this year more than $40,000,000 worth of sugar alone, or more than one-sixth of this country's consumption of that product, and her exports and imports, with this product as almost their sole basis directly and indirectly, will considerably exceed those of the entire United States at the time of the adoption of the Constitution.

Hawaii being within the tropics, the question of water is of superlative importance. The rainfall is abundant, ranging from a few inches to several hundred inches a year according to locality, but the more abundant fall is usually distant from the land where it is most needed. The problem is that of its conservation by way of preventing it from escaping immediately to the sea in freshets, and that of transferring it to the arid lands. It has been demonstrated that land which, with an ample supply of water properly applied produces, say, ten tons of sugar to the acre, produces only four-fifths of a ton under a rainfall of 32½ inches a year. Most of the irrigated plantations have less than this amount of rainfall. One hundred and five thousand acres or about one-half of the 213,000 acres devoted to sugar production, only about one-half of which is cropped annually, is practically reclaimed arid land,—entirely through private enterprise. The reclamation of this land has involved an expenditure of about $15,000,000 or more than $140 per acre in initial outlay for the construction of ditch, tunnel, flume and pipe lines, reservoirs, pumping plants, artesian and surface wells and electric plants for the generation of power for pumping plants. A single system for one group of plantations includes about 225 miles of main and lateral ditches, tunnels, etc., costing a million and a half dollars, besides wells, reservoirs and pumping plants. In one instance, electric power is generated by water on the rainy side of the island for the operation of pumps on the opposite or dry side. There are 111 pumps in operation with a capacity of 580,000,000 gallons per 24 hours. Sixty per cent. of the water used on irrigated plantations is pumped. The average lift is 191 feet, with a maximum of 550 feet. One acre requires about 5,000,000 gallons per crop or about 10,000 per day. The expense is great but it is a necessity and it pays. The irrigated lands produce nearly twice as much as the unirrigated. Though constituting only half the total area they produce about two-thirds of the total output of 500,000 tons of sugar.

In view of the foregoing, the preservation and extension of forests are obviously prime necessities. The typical islands consist of a high central mountain with radiating ridges and valleys. From ancient times the islands have been subdivided in apple-pie fashion, the typical main division of land extending from seashore to mountain-top and comprising one or more valleys with their side ridges. Even in ancient times each valley had its own network of small ditches for purposes of irrigation. The water-sheds

are short, the slopes, steep; there are few permanent springs; it is the forests that must be relied on to hold the water for the steady supply of the streams. The relation between the forests above and the near-by arable plains or gentle slopes below in respect of water supply is too obvious to be disputed. Before the possibilities and needs of irrigation became apparent, much wasting of the forests by cutting and through destruction by live stock was permitted, with most disastrous results, as it now appears. Accordingly, more than thirty years ago, steps were taken by legislation for the preservation and extension of the forests, but not until five years ago was a comprehensive statute passed creating an effective board of agriculture and forestry with adequate powers. Since then 444,000 acres have been set aside by 16 proclamations of the Governor on the recommendation of the Board as forest reservations, of which 61 per cent. is Government land, and within the next few years this area is expected to be extended to about 750,000 acres, or about 80 per cent. of the total forest area, of which about 70 per cent. will be Government land. Government and private lands are sandwiched in with each other and it is of the greatest importance that the Government and private owners coöperate with each other in this matter. Fortunately the need is so obvious and the methods of procedure have been of so friendly a nature that practically no difficulty has been experienced in obtaining the active coöperation of the private owners in the setting aside and fencing of reservations and the keeping out of live-stock. In addition to this nearly one-fourth of the sugar corporations besides many ranchmen and others, are actively engaged in tree planting. Only a comparatively small percentage of forest area or area available for forest on the mainland is in Government ownership. If forestry is to be carried to the extent desired it is essential that private owners be induced to coöperate with the Government or else that private lands be condemned for forest purposes. The principal means of bringing about coöperation would seem to be education—a means which this conference will largely serve to effect and which is already being effected through many other channels.

It is not alone to the question of irrigation in connection with the sugar industry that science has been called upon to contribute. It has been called upon to contribute equally in almost every phase of that industry—in methods of manufacture and cultivation, fertilization, chemistry, entomology, plant pathology and physiology. More than $2,000,000 is expended annually in the purchase of fertilizers, besides which large quantities not purchased are used. The cost for this item alone averages $4.55 per ton of sugar or $22.20 per acre per crop. The planters maintain an experiment station with a large corps of scientists, covering nearly every department of the industry, at an expense greater than that of any experiment station, public or private, on the mainland, with possibly one or two exceptions.

So much as to one industry by way of illustration of the value of the application of science to agriculture in all its aspects. Through the Federal Experiment Station, the Territorial Board of Agriculture and Forestry, and other mediums a good beginning has been made in the same direction in other industries with most promising results—in the pineapple, rubber, sisal, tobacco, and other industries. A college of agriculture has been established; instruction in agriculture as well as in the mechanic arts is made more and more prominent in the public schools, a beginning having been made in this direction as long ago as 1831 and 1836 when industrial training schools, the first in the United States, were established—which in large measure suggested to General S. C. Armstrong, who was born and brought up in Hawaii, the ideas which he later embodied in Hampton Institute.

The needs and opportunities are such that every effort must and will be made in Hawaii to perfect a science of tropical agriculture and build up a group of tropical agricultural industries to the highest point of efficiency to which they can be brought by the application of scientific methods. What is needed now, outside of transportation and other facilities, through the scientific branches of the Federal Government, is assistance in forestry and in soil, topographic and hydrographic surveys and branch experiment stations—so comparatively new is the field of scientific tropical industry and so unique are the conditions of wide variation in rainfall, temperature and soils within shortest distances in Hawaii.

The second point to which I wish to refer is that of the location of Hawaii at the commercial center or cross-roads of the Pacific—which, the greatest of oceans, between the richest of continents, is fast approaching the fulfillment of the long-ago prophecies of von Humbolt, Seward and others, to the effect that it would eventually be the theater of the world's greatest commerce. If the inland waterways of the Mainland, especially those of the great Mississippi Valley are to be developed to the extent which seems likely in the near future, and if the Panama Canal is to be completed, as it must be, within a few years, not only is it a corollary that Hawaii must be provided with adequate harbor facilities in order to make these other great works serve most completely their purposes, but obviously one of the most effective methods of conserving the natural resources of the United States is by taking advantage of, through these provisions for adequate transportation facilities, the vast natural resources of other countries and especially those of China which are perhaps, next to those of the United States, the richest in the world and as yet practically untouched. The location of Hawaii, which thus far has proved one of the greatest obstacles to her industrial prosperity, will hereafter be one of her greatest assets, and with the proper development of her harbors through Federal aid she will, small though she is, have the proud honor of playing a part out of all proportion to her size in the conservation of the natural resources of the nation.

PRELIMINARY REPORT OF THE TERRITORIAL CONSERVATION COMMISSION OF HAWAII.

Honolulu, Hawaii, Nov. 14th, 1908.

Honorable W. F. Frear, Governor of Hawaii, Honolulu, Hawaii.

Sir:—The Territorial Conservation Commission of Hawaii has the honor to submit herewith a preliminary report on the nature and present condition of the natural resources of the Territory, together with certain recommendations looking to their proper development and wise use.

The duty of the Commission is to inquire into the natural resources of the Territory, to bring together the available information in regard to their present condition, and in coöperation with the National Conservation Commission and the Conservation Commissions of other states and territories to assist in formulating plans whereby the material resources of the Nation as a whole and of this Territory in particular may be wisely and conservatively used "in such a way as to promote the greatest good of the greatest number for the longest time."

The whole economic fabric of the Territory of Hawaii is closely bound up with the right use of its natural resources. Although politically an integral part of the Union, in situation Hawaii is remote from the other states and territories. Notwithstanding this fact even a casual inspection of the local problems of conservation shows that the majority of them are shared in common by Hawaii and by mainland states. The possibility of any extensive development of the resources of Hawaii depends on the continued prosperity of the mainland. The prosperity of the mainland rests in turn on the wise use of the sources of national wealth. Consequently both because of its own local problems and because of the relation that the wise use of the resources of the mainland bears to the question, Hawaii takes a real and vital interest in Conservation and in all that pertains thereto.

The natural resources of Hawaii are waters, soils and forests. Minerals can at present hardly be said to claim a place in the list, although recent developments in the making of lime from coral sand are an indication that as the result of a comprehensive investigation cement making and perhaps other industries dependent on mineral wealth could also be developed. Incidentally it may be remarked here that certain red earths, not uncommon in the Territory, have long been used locally in the preparation of paints.

Hawaii is essentially a country dependent on agriculture. From its geographic position, its sub-tropical clmiate, and the peculiarities of its topography, irrigation plays a large and increasingly important part in the economic development of the Territory. The main industry is the production of sugar cane. Of the fifty

odd sugar plantations over half are irrigated. On the non-irrigated plantations much water is needed for fluming cane to the mill or for power development. Other important industries are the growing and canning of pineapples, the production of rice, coffee, sisal and bananas, and cattle grazing. Rubber and tobacco give promise of good returns if rightly handled.

Waters.—For the successful development of all these industries water is needed in larger or smaller quantities. In many cases this necessitates a supply artificially procured. There have already been built, wholly by private enterprise and at private expense amounting to over $15,000,000, elaborate irrigation systems to supply water for the irrigation of the sugar plantations. But as yet only a part of the water that could be turned to account is utilized. In the harnessing of the streams to produce power much also remains to be done.

Naturally the first step in a more complete and rational utilization of this great source and producer of wealth is an accurate and exhaustive examination of the water resources of the Territory. In the judgment of this Commission the need for such a survey by competent water experts is the most pressing necessity in the way of Conservation work, for on the possibility of bringing more water onto the land depends the whole future development of the Territory.

There are no navigable streams in the Territory of Hawaii. The value of water centers in its use for irrigation and power development.

Forests.—The primary value of the forests of Hawaii is that they serve as a protective cover on the steep, short water sheds of the streams needed for irrigation. This use was early recognized and has led to the setting apart of forest reserves—at first by private owners and later, during the last five years, under the direction of the Territorial Government. At the present time the total area of existing forest reserves is 444,116 acres, or about one-tenth of the total area of the Territory. Later it is expected considerably to increase the area so set apart.

In certain of the leeward districts, where the question of stream protection does not enter, the Hawaiian forest has commercial value, and is being systematically exploited. The principal products are Ohia Lehua railroad ties and Koa lumber—in the trade called Hawaiian Mahogany—a fine grained, rich-colored hardwood, of value for interior finish and cabinet work.

The forest work of the Territory is carried on by technically trained men, Hawaii being one of the eleven States of the Union to employ a professional forester.

Lands.—Outside of the lands now under cultivation and those that should be kept permanently under forest there are considerable areas that with the application of water could unquestionably be made of high productive value. This class of land is now used principally for cattle grazing. In the aggregate it includes

many thousand acres. It would appear that much of it is susceptible of reclamation for some more intensive form of agriculture. Here again the present need is for a thorough and careful study by experts. It should first be ascertained how much of this class of land can be brought under irrigation and second for what purposes it is best adapted if an adequate water supply were once assured. This indicates that along with a hydrographic survey there should also be a soil survey and a systematic classification of the land according to the uses to which it is best adapted. Such investigations pave the way for the incoming of the man who can successfully establish a home and build up a self-sustaining industry.

In addition to the lands that can be reclaimed through irrigation there are in Hawaii large tracts of waste land, such for example as areas covered by comparatively recent lava flows. Much of this class of land must always remain as waste land but portions of it are probably susceptible of being turned to useful account. A systematic classification of all lands would be a long step in this direction.

ORGANIZATION AND WORK OF THE COMMISSION.

The Territorial Conservation Commission of Hawaii was appointed by Governor Frear on July 23rd, 1908. Upon the organization of the Commission at a meeting held on July 31st, 1908, it was decided to take up the investigation through committees, as follows:

Forests: Messrs. Hosmer and Gartley.
Waters: Messrs. Gartley and W. O. Smith.
Lands and Soils: Messrs. J. G. Smith and Dillingham.

The several committees at once set about getting statistics and other information. Some of these data are submitted herewith in the form of appendices. Other data are not as yet in shape to be given out but will form the subject of a later report. The statements made in the appendices, while accurate as far as they go are therefore to be considered as preliminary only and subject to amplification.

It is perhaps not surprising that it has taken longer to collect accurate information concerning the natural resources of the Territory and their present condition than was at first anticipated. Many of the figures essential to such a compilation were found not to be available or only obtainable after extended inquiry. This condition has brought home to the Commission the extreme desirability of having in Hawaii some Territorial official charged with the duty of compiling statistics. On almost all the lines of inquiry before the Commission it should be possible to get facts and figures but as it is now the desired data are only to be had from individuals and corporations. There is no impropriety in the making public of the greater part of these data, nor are the

corporations who have them unwilling to let them be so used. If there were a Territorial Statistician to attend to the collection of these and similar data valuable information on many subjects which it now takes weeks of labor to obtain would be available for instant reference.

RECOMMENDATIONS.

As a result of the study that has so far been made the Territorial Conservation Commission of Hawaii is unanimously of the opinion that for the best interests of the Territory there is urgent need of action looking to the conservation and more systematic use of the natural resources of the Territory.

To this end the Commission makes the following recommendations:

First. That active steps be taken to secure from the Territorial Legislature at its coming session an appropriation of not less than $5,000 per year for a topographic and hydrographic survey of the Territory of Hawaii, to be made by the U. S. Geological Survey.

Following the usage customary in such coöperative agreements, the appropriation should be made contingent on the expenditure of an equal sum by the Federal Government. Such a survey would serve as a basis for a later and more extended study of the problems of reclaiming the many thousand acres of potentially agricultural land that require irrigation for successful development.

It is further recommended that this project be brought to the attention of the proper departmental authorities in Washington in such a way as to attract their interest and support.

Second. That there should be undertaken under the auspices of the Territorial Government a careful and thorough classification of the public lands of the Territory, with especial reference to the adaptability of those not now under cultivation for use in the development of diversified industries.

Third. That further to make available accurate information of assistance to prospective settlers and others appropriate action be taken to secure the extension to Hawaii of the soil survey conducted by the Bureau of Soils of the United States Department of Agriculture.

Fourth. That in view of the fact that the successful development of diversified industries in Hawaii depends in large measure on making the agricultural lands accessible, the importance of good roads and other means of inland transportation be emphasized.

In Hawaii there are no internal waterways to assist in transportation. Consequently it is the more necessary that adequate appropriations be made by the Territorial and local authorities for the building and up-keep of the principal and secondary roads.

Fifth. That an appropriation be secured at the coming session of the Legislature for a Territorial Statistician.

Such an official should properly be attached to one of the existing departments. The salary should be sufficient to secure the services of a capable person and provision should be made for a certain amount of clerical assistance.

Sixth. That a systematic attempt be made to develop and more firmly to establish diversified industries in the Territory.

To this end the Hawaii Experiment Station should receive not only the moral but the financial support of the Territory, in order that it may enlarge the scope of its work, particularly in the way of establishing local demonstration areas.

Very respectfully,

(Signed) Ralph S. Hosmer,
William O. Smith,
A. Gartley,
W. F. Dillingham,
Jared G. Smith,
Territorial Conservation Commission of Hawaii.

Appendix "A."

REPORT OF THE COMMITTEE ON FORESTS.

Honolulu, Hawaii, Nov. 14th, 1908.

For a clear understanding of the forest situation in Hawaii it is necessary that one be acquainted with the conditions of topography and local climate. Lying in the belt of the northeast trade winds and being mountainous it follows that the Hawaiian Islands have a climate characterized by contrasts. On the windward slopes of the mountains is an area of high precipitation; in the leeward districts scant rainfall, even appproaching aridity, is the rule. These facts coupled with the remarkable porosity of the soil, due to its volcanic origin, have a very direct bearing on the forest situation.

There are two main classes of forest in Hawaii. Both are of economic value; one because it helps to conserve the water needed for irrigation, power development and domestic supply, the other because it produces wood and timber. The forests of the former class are as a rule situated on the moist, windward slopes of the higher mountains. They are essentially "protection forests" in that their main value rests in the water that can be got from them.

Those of the latter class, the commercial forests, are found in the districts where because of the absence of running streams watershed protection does not figure. The forests of the first class are by long odds the most important, for in Hawaii the relation between sustained stream flow and a watershed protected by a forest cover is intimate and peculiarly direct.

Hawaii is a country essentially dependent on agriculture. The main crop is sugar cane. On more than half of the 54 plantations irrigation is essential for successful cultivation, for although the soil in the leeward districts is rich it requires water to be made commercially productive. Water is also needed on the non-irrigated plantations for the development of power for the fluming of cane. The important part that irrigation plays in Hawaii may perhaps be made more apparent by the statement that over fifteen million dollars has been expended, wholly by private enterprise, in developing the irrigation systems that supply water to the cane fields of the irrigated plantations.

The importance of the forest is generally recognized in Hawaii and has led to a strong public sentiment in favor of forestry. This finds expression in a Territorial Forest Service charged with the creation and administration of forest reserves and with the prosecution of other forest work. During the past five years under a definite forest policy systematically followed sixteen forest reserves have been set apart, with an aggregate total area of 444,116 acres. Of this area 273,912 acres, or 61 per cent., is land belonging to the Territorial Government. The other 39 per cent. is in private ownership but for the most part the owners of the lands, fully aware of the benefits of forest protection, coöperate actively with the Territorial Government in the management of the forest reserves.

There are three main types of forest in Hawaii, the Koa and Ohia forest lying between the elevations of two and six thousand feet; the Mamani forest, a pure stand of another native Hawaiian tree found on the upper slopes of the higher mountains; and the introduced Algaroba forest, which occurs at the lower levels on the leeward side of each of the larger islands.

The typical Hawaiian forest is of the first type. The forest consists of a dense jungle of trees, high growing shrubs, tree-ferns and climbers, with much undergrowth and a heavy ground cover of ferns and bracken. Altogether it is a plant community admirably adapted for the conservation of moisture, for preventing erosion and for serving as a reservoir to feed the springs and streams that rise within its bounds. The most important trees are Ohia Lehua *(Metrosideros polymorpha)* and Koa *(Acacia Koa)*.

The forest in all the forest reserves is of this type. A recent compilation of the forest areas of the Territory shows that the Koa and Ohia forest covers approximately 1,175,000 acres. Of this area it is estimated that eventually about three quarters of a million acres will be included within forest reserve boundaries, of which about 70 per cent. will be Government land.

Above the level of the Koa and Ohia forest, on the slope of Mauna Kea (elevation 13,825 feet), on the island of Hawaii, is found a nearly pure stand of another native Hawaiian tree, Mamani *(Sophora chrysophylla)*. This forest occurs in a belt lying between the elevations of 6,000 and 8,500 feet. The area of the Mamani forest on Mauna Kea is 63,500 acres. Mamani occurs elsewhere in the Territory but does not at the present time form what may be called forests. It is, however, spreading rapidly so that in future years it will play a much larger part than it does now.

Mamani makes excellent fence posts, for which purpose the trees in the upper forest belt are cut for local use. No accurate figures as to the number cut are now available. Otherwise this type of forest is unimportant commercially.

The Algaroba *(Prosopis juliflora)* is the Mesquite of the Southwest. This tree was introduced into the islands in 1837. It has now spread so as to cover between fifty thousand and sixty thousand acres below an elevation of 1,000 feet in the leeward districts of the larger islands of the group. It is spreading rapidly along the leeward coasts and is also gradually climbing to a higher elevation.

The Algaroba forest is the largest single source of fuel supply in the Territory. It is estimated that over 3,000 cords are sold annually in Honolulu. The price varies from $12 to $14 a cord, delivered.

The Algaroba forests are further of value because the pods make good stock feed and also because the tree is one of the important plants locally for bee food. It is estimated that for the calendar year 1907, the total amount invested in apiaries and other equipment for the manufacture of Algaroba honey was $125,000 and that the gross receipts for Algaroba honey products for the year were over $25,000.

It has already been shown that the primary value of the Hawaiian forest rests in the influence it exerts on the conservation of water and that the commercial aspect relatively takes second place. But in the leeward districts on the Island of Hawaii are considerable areas where owing to the great porosity of the soil there are no permanently running streams. Here the main value of the forest rests in the wood and timber that it can be made to produce. The two Hawaiian woods of commercial importance are Koa and Ohia Lehua. Both are heavy, close-grained hardwoods. Koa is used for interior finish, furniture, cabinet work and veneering. It is now sold in the markets of the American mainland under the name "Hawaiian Mahogany." Ohia is valuable for railroad ties. The systematic lumbering of this class of Hawaiian forest began in October, 1907, when a contract for ninety million board feet of Ohia railroad tie material was made between a local company and the Santa Fe Railway.

A tie mill with a daily capacity of 2,500 ties has recently been

erected. The first regular shipment of ties is about to be made. No accurate estimate either of the amount of timber or the exact area covered by forests of the commercial class have yet been made, but the area is sufficient and the stand heavy enough to justify the continuation of lumbering operations for a considerable time.

The fact that none of the native trees in Hawaii furnish construction timber has led to extensive tree planting, both by the Territorial Government and by private interests. This work has been going on for the last thirty years and is constantly increasing in extent and importance. The trees principally planted are several kinds of Eucalyptus, the Australian Ironwood and Silk Oak and the Japanese Cedar. Wood and timber cut from the planted forests in Hawaii is now being used for fence posts, railroad ties, bridge timbers and wagon work. Practically all the construction timber used in Hawaii is imported from Puget Sound and Northern California, mainly Redwood and Northwest (Douglas Fir).

In the reports of the U. S. Department of Commerce and Labor it is stated that for the fiscal year ending June 30th, 1907, there was imported into Hawaii from the mainland thirty million six hundred and three thousand feet, board measure, of timber boards and planks, valued at $565,425.00. For the same year 17,476,000 shingles, valued at $39,207.00 and other unmanufactured lumber to the value of $116,756 were also imported, making in all a total of $721,388.00 for unmanufactured wood products. The value of manufactured wood products imported during the same fiscal year was $214,648.00. Further comment on the desirability of doing even a little towards securing a local source of supply is unnecessary.

It may perhaps be pertinent in closing this statement to note that a forest fire law similar to that of California was enacted by the Territorial Legislature at the Session of 1905. The Territorial Superintendent of Forestry is *ex officio* Chief Fire Warden and provision is made for a corps of District Fire Wardens to be paid for duty actually performed.

As a matter of fact plantation managers and other influential citizens agreed to take these positions without remuneration. The law provides penalties in case of damage resulting from the careless or malicious use of fire. Since its enactment there have been few fires of consequence, due in part to a better public sentiment created by the presence of the law on the statute books and to the interest aroused in the matter at the time of the enactment of the law.

Following is a table showing the names, location, dates of proclamation and areas of the 16 forest reserves so far established in the Territory of Hawaii.

(Signed) RALPH S. HOSMER,
A. GARTLEY,
Committee on Forests.

FOREST RESERVES, TERRITORY OF HAWAII.

Arranged in Chronological Order.

(Corrected to October 31st, 1908.)

No.	Name.	District.	Island.	Total Area Recommended to be Reserved.	Area Government Land.	Area Private Land.	Date of Proclamation.	Proclamation Signed by.
1	Kaipapau	Koolauloa	Oahu	913	913	.....	Nov. 10, 1904	G. R. Carter
2	Hamakua Pali	Hamakua	Hawaii	18,940	16,333	2,607	Dec. 23, 1904	"
3	Hilo	Hilo	Hawaii	110,000	60,223	49,777	July 24, 1905	A. L. C. Atkinson
4	Koolau, Maui	Koolau-Hamakualoa	Maui	42,969	30,230	12,739	Aug. 24, 1905	"
5	Halelea	Halelea	Kauai	37,500	10,990	26,510	Aug. 24, 1905	"
6	Kealia	Puna	Kauai	9,935	7,385	2,550	Mar. 9 1906	"
7	Ewa	Ewa, Waianae and Waialua	Oahu	28,550	5,151	23,399	Mar. 9 1906	"
8	Honuaula	Kona	Hawaii	65	665	.....	April 4, 1906	"
9	Kau	Kau	Hawaii	65,850	59,618	6,232	Aug. 2, 1906	G. R. Carter
10	Waianaekai	Waianae	Oahu	3,257	3,150	107	Sept. 7, 1906	"
11	Lualualei	Waianae	Oahu	3,743	3,743	.....	Nov. 30, 1906	"
12	Hana	Hana	Maui	14,825	13,767	1,058	Nov. 30, 1906	"
13	Na Pali, Kona	Na Pali and Kona	Kauai	60,540	40,650	19,890	June 12, 1907	A. L. C. Atkinson
14	West Maui	Lahaina, Kaanapali and Wailuku	Maui	44,440	19,105	20,335	April 21, 1908	W. F. Frear
15	Makawao	Hamakuapoko	Maui	1,796	1,796	.....	April 21, 1908	"
16	Waiaha Spring	Kona	Hawaii	193	193	.....	April 21, 1908	"
	Grand Total on October 31, 1908			444,116	273,912	170,204		

Appendix "B."

REPORT OF THE COMMITTEE ON WATERS.

Present and Prospective Use of Water for the Development of Power in the Hawaiian Islands.

Honolulu, Hawaii, Nov. 14th, 1908.

In considering the conservation of the resources of this Territory the possibility of the development and utilization of water power should be given very serious consideration.

At the present time a few developments have been made which are of considerable economic value and there are great possibilities for future development. At the present time practically all the water power is in use generating electric power to supply motive power for irrigating pumps, the most important one being the Kauai Electric Company on the island of Kauai, where two twelve hundred kilowatt generators are installed in Wainiha Valley, utilizing some forty million gallons per day at a head of 575 feet. Power is transmitted 35 miles to the McBryde Sugar Company's plantation and there utilized in operating six multiple-stage centrifugal pumps direct connected to motors of an aggregate horsepower of 4,000. These pumps have a capacity of 31,000,000 gallons at a head of 175 to 400 feet, thus serving to irrigate over 3,000 acres of cane.

At Kekaha, Kauai, water is taken from a high level irrigating ditch and dropped 275 feet to irrigate the low level lands. At this point a six hundred kilowatt generator is installed to furnish power for four motors direct connected to multiple-stage centrifugal pumps having an aggregate horsepower of 700, the pumps having a capacity of 7,000,000 gallons at a head of 300 feet. The water for these pumps is taken from an irrigating ditch and pumped to a level above the ditch, thus rendering 700 acres of good cane land available.

The Pioneer Mill Company, at Lahaina, Maui, has installed a 250 kilowatt generator operated by water power which furnishes current for 200 horsepower motor operating a triplex reciprocating pump, which delivers 9,000,000 gallons of water against a head of 100 feet.

The Oahu Sugar Company, on the Island of Oahu, take water from an irrigating pipe line and develops 120 kilowatts, which supplies a 100 horsepower motor direct connected to a centrifugal pump.

The Makee Sugar Company, at Kealia, Kauai, has installed and in operation a 300 kilowatt generator supplying current to a 225 horsepower motor operating a reciprocating pump having a capacity of 2,800,000 gallons of water against a head of 250 feet.

The Waianae Sugar Company, on the island of Oahu, has installed two 200 kilowatt generators supplying current to motors of 375 horsepower to pump six and a half million gallons of water against a head of 150 to 280 feet.

The Hilo Electric Light Company, on the island of Hawaii, develops 750 horsepower to operate generator of an aggregate capacity of 450 kilowatts to supply light and power for the City of Hilo.

The Territory of Hawaii has installed and in operation in Nuuanu Valley, Island of Oahu, water power driven generators of 400 kilowatts capacity for supplying arc lights and Territorial Government lighting in the City of Honolulu.

There are several small water power developments in mills varying from 10 to 50 horsepower which are used for operating machinery or electric generators.

The aggregate horsepower of these developments is approximately 6,500 horsepower.

It is impossible to make an estimate of the prospective power development and at best only a few can be mentioned. These are such powers as have been rendered available through partial developments made for irrigating purposes or where the possibilities are self evident. The conservation and development of water at high levels for irrigating purposes will render many other plants both possible and expedient. A close approximation of the ultimate possibilities can only be made when complete surveys of the watersheds, records of the rainfall and the cost and economic value of the developments are obtained.

The island of Kauai presents a fertile field for future development and there are at the present time some 2,000 horsepower additional at Wainiha which is not being utilized; possibly 4,000 horsepower at Hanalei, and 1500 or 1800 horsepower at Makaweli, 500 or 600 horsepower at Hanapepe, and by the development of reservoirs back at Waimea, Wahiawa, Koloa, Wailua, Kapaa, Anahola and Kalihiwai several hundred horsepower can be made available.

On the island of Oahu possibly 2,000 horsepower can be developed at Wahiawa and from the new high level reservoir in Nuuanu Valley.

On Maui the Hawaiian Commercial & Sugar Company at Kanai and in Iao Valley can develop about 2,500 horsepower; and there are several hundred horsepower available at Waihee in the development of the Wailuku Sugar Company. Some 1,200 horsepower could be rendered available at Lahaina from the development of the Pioneer Mill Company.

The power resources of the island of Molokai are practically undetermined.

On the island of Hawaii it is estimated that in the Waipio Gulch some 8,000 horsepower can be rendered available by the present irrigating ditch development and on the north coast from Waipio to Hilo there are large quantities of water going to waste or in use for fluming cane which could be developed. No estimate of the amount of this power is available, but it would amount to several hundred horsepower.

Storage capacity constructed in the Kohala Mountains would render power available, but at present the quantity is entirely undetermined.

At many places the permanency of the flowing streams is not assured, but the development of storage capacity would render the power secure and in many cases would increase the estimate of the amount availabie. However, the broken character of the country where these powers are available and the limited amount of arable land and water available for this land makes the economic value of the development of these powers questionable.

The production of fertilizers from atmospheric nitrogen by the use of electricity may render the water power extremely valuable at such places where the power cannot be used for pumping water for irrigating purposes.

(Signed) A. Gartley,
W. O. Smith,
Committee.

Appendix "C."

HAWAIIAN SUGAR PLANTATION STATISTICS.

Honolulu, Hawaii, Nov. 14th, 1908.

The enclosed Crop Reports for the year ending September 30th, 1908, show the number of tons of sugar produced on the sugar plantations in the Territory of Hawaii, by plantations and islands, and the names of the various agents and also the tons of sugar produced on each plantation for each of the ten years from September 30th, 1899, to October 1, 1908, inclusive.

The average yield of sugar per ton for all of the plantations was in 1906, 8,945 lbs. per acre, or, in round numbers, 4½ tons; the average of the irrigated plantations was 11,526 lbs., or 5¾ tons; and the average of the unirrigated plantations was 6,140 lbs., or a trifle over 3 tons per acre.

The total area of the land in these islands is 4,127,360 acres. Of this about 200,000 acres are under cultivation in sugar, of which about 105,000 acres are irrigated and 95,000 acres are unirrigated.

On the irrigated plantations about 1,000,000 gallons of water is applied per day to each 100 acres of land. To December, 1906, the cost of the irrigation systems of the several plantations was $14,069,804.88.

A little over $2,000,000 is expended each year for fertilizers. An average of about $4.65 for each ton of sugar produced, and $22.20 per acre for the crop.

It must be borne in mind that from eighteen to thirty months is required to mature a crop of sugar cane, so that the number of acres cultivated for each crop does not represent the total area under cultivation. For the crop of 1906, 96,228.6 acres were cultivated, producing 430,368.2 tons.

The plantation companies are nearly all incorporated, and the shares of stock are held by about 7,000 stockholders.

Note:—As most of the readers of the Forester have already received copies of the printed tables issued by the Hawaiian Sugar Planters' Association, it is only necessary here to give the totals by islands, as follows:

10 HAWAIIAN SUGAR CROPS, 1899-1908, FROM SEPTEMBER 30, 1899, TO OCTOBER 1, 1908.

	1899 *Tons	1900 Tons	1901 Tons	1902 Tons	1903 Tons	1904 Tons	1905 Tons	1906 Tons	1907 Tons	1908 Tons
Hawaii	117,239	115,224	134,618	121,295	170,665	122,865	126,405	137,750	143,891	180,159
Maui	54,389	57,347	58,349	56,726	84,776	77,985	100,434	102,960	104,772	122,629
Oahu	45,820	53,625	99,534	107,870	121,066	102,019	123,095	113,750	119,273	137,013
Kauai	65,359	63,348	67,537	69,720	61,484	64,606	76,314	74,753	72,081	81,322
Total	282,807	289,544	360,038	355,611	437,991	367,475	426,248	429,213	440,017	521,123

* 2000 Pounds to the Ton.

Appendix "D."

PRODUCTION OF LIME ON THE ISLAND OF OAHU.

Honolulu, Hawaii, Nov. 14, 1908.

The Waianae Lime Company has 305 acres of land at Waianae, Oahu, from whence limestone is brought to Honolulu in raw state by cars of the Oahu Railway & Land Company and delivered at kilns situated at Iwilei adjacent to the oil tanks. At Iwilei the plant consists of cooper shop, barrel warehouse, lime warehouse and kiln building. Kilns are two in number, known as Schneider Patent Upright Kilns, are equipped with forced draft and have capacity of two hundred and seventy-five barrels per day. Lime is of high calcium quality and averages 97.20 pure, and is mostly used for fertilizer on sugar plantations.

EXHIBIT OF ISLAND PRODUCE.

The suggestion to make an exhibit of Hawaiian produce at Washington during the next eight or nine months, while the tariff is under revision, is an excellent one, though the benefit accruing from making the exhibition would probably justify the expense of rendering it permanent. If such a collection were centrally situated where all who visit Washington could inspect and test our island produce, the benefits to be derived would be of far more value than a discussion of tariff rates and schedules.

Such an undertaking should include a display of our pineapples shown in glass jars, of our coffee, our tobacco, rubber, sisal and various island fruits, both fresh and preserved. It should also be prepared to distribute samples of all our goods put up in as attractive a manner as possible, and to keep a supply of choice fresh fruit to introduce to visitors such varieties as our producers are endeavoring to market.

From the plot of spineless lime trees at the Dominica Botanic Station a crop of 26 barrels of fruit was obtained in 1906-7, and 29 barrels in 1907-8. The plot which consists of twenty-eight trees, planted at distances of 12 feet by 12 feet, has received a mulch of leaves each year in the dry season.—*Agricultural News, Barbados.*

The amount of balata shipped from the North-Western District of British Guiana for the year 1907-8 was 153,532 lbs., as against 149,342 lbs. exported in 1906-7. The rubber exports, however, fell from 1,638 lbs. in 1906-7, to 944 lbs. in 1907-8. Small farmers in the district are reported to be planting the native rubber trees (*Sapium* spp.) on their lands in considerable quantity.

PAPER READ AT THE ANNUAL MEETING OF THE HAWAIIAN SUGAR PLANTERS' ASSOCIATION NOV. 11, 1908.

By L. A. Thurston, *for Committee on Forestry.*

EXPORT OF OHIA TIES AND LUMBER.

The most notable event has been the beginning of operations by the Hawaiian Mahogany Lumber Company, Limited, in the production and export of Ohia ties, in filling the order for 2,500,000 ties contracted to be delivered to the Santa Fe Railroad.

A large saw mill has been erected at Pahoa, in the District of Puna and Island of Hawaii, and operations were begun there late in September last. The first shipment of approximately 20,000 ties is now being loaded on to the Emily F. Whitney at Hilo.

UTILIZING WASTE.

There is a very large waste in making ties which the lumber company is endeavoring to utilize in by-products. Hardwood boards and battens to a considerable amount have been incidentally produced and a shipment of 15,000 feet were sent to San Francisco on the last Enterprise. It is believed that a market for a considerable amount of by-product lumber of this nature can be found, both here and at the Coast.

The chief drawback to this lumber is its tendency to warp; but it is believed that by piling and curing the same under proper conditions this difficulty can be obviated.

The Ohia lumber is so hard and tough that it is believed that it can be used to good advantage as flooring and siding for cane cars which, when made of Douglas fir, wear out rapidly. The company will soon have stock enough on hand to furnish this lumber to those desiring to try it.

The company is also taking steps to produce telephone pins and brackets from other portions of the waste lumber, there being a large demand for this on the mainland.

TIES FOR ISLAND USE.

Incidental to the manufacture of ties for the Santa Fe contract, the company is also producing from the smaller timber ties for local use at prices which compete with redwood ties, while being much better and more lasting in quality than the redwood ties.

Ties have been furnished by the company to the Hilo Railroad, the West Hawaii Railroad, the Koolau Railroad, the Oahu Railroad and to the Ewa, Waialua, Makee Sugar Company, Makaweli, Lihue and Koloa sugar plantations.

Ties are also being furnished to Lewers & Cooke, who intend to keep them in stock.

CULTIVATED VS. UNCULTIVATED FORESTS.

The fact that ties can be manufactured and exported from here to the Coast, and manufactured and sold locally to successfully compete with the heretofore cheap lumber of the Pacific Coast again brings to the front the subject which has been so frequently urged upon the sugar plantations that one of the greatest economies which they can practise is to plant trees for railroad ties, fence posts and firewood.

There are but few plantations left so located that natural forest supply can be relied upon for these purposes. Even where natural forest is still available therefor, the supply is so limited that a very few years will end the supply.

More and more of the sugar plantation managers are recognizing this fact and the last year has seen a constantly increasing number who are taking advantage of the offer of the Forestry Department of the local government to furnish foresting plans and recommendations and send an expert on to the ground to lay out and advise concerning the location and character of nurseries, kinds of trees to be planted and location of planting grounds.

In this connection the writer was, many years ago, greatly impressed with the results obtained on the Lihue Plantation by plowing up land and cultivating a planted forest area as compared with the simple holeing and planting of trees and leaving them to their fate.

The rapidity of growth and the thrift of the cultivated trees as compared to the others was most striking.

A couple of years ago the writer suggested to Mr. Louis von Tempsky, manager of the Haleakala Ranch, to try the experiment there. Mr. von Tempsky, who is an enthusiastic tree planter, followed the suggestion, and has achieved remarkable results which are best set forth in his own language. The following is his report of the results.

REPORT OF L. VON TEMPSKY ON CULTIVATED VERSUS UNCULTIVATED LAND FOR TREE PLANTING.

"It was suggested to me that I try an experiment in tree planting on the above *lines*, to find out the difference in the cost and results of the two methods.

"In September, 1907, I measured off a rectangular piece of land containing exactly four acres. One acre I furrowed out, and "kipikuaed" holes six feet each way. The other three acres I plowed and harrowed twice, and as the manienie sod was very heavy I had to hand work the whole piece, going over it with "kipikuas" and packing out what wouldn't burn; as the weather was quite wet I could not get a fire on the grass prior to plowing; this of course made the preparation of the three acres very expensive. I selected this spot especially as I thought it would be a good

place to determine the maximum cost of preparing land for planting trees in this style.

"The seedling trees I selected were, Eucalyptus Amygdalina, E. Botryoides, E. Corymbosa, E. Corynocalyx, E. Leucoxylon, E. Paniculata, and E. Rudis, which were recommended to me by the Australian Forestry Service as being considered by them to be among the best of their trees for railroad ties and fence posts.

"The cost of the two pieces is as follows:

One Acre Lot.

Furrowing	$ 2.60
Holeing	3.60
Planting	2.60
Weeding to date (twice)	9.60
	$ 18.40

Three Acre Lot.

Plowing	$ 16.09
Harrowing	3.15
Kipikua work and twice weeding	102.70
Holeing	17.44
Planting	7.52
	$146.90

Or $48.97 per acre.

"The holeing of the three-acre piece cost more than it should have done, as owing to running out of seedling trees, planting of about half this lot had to be postponed, and the holes dug over again.

"To offset to a certain extent the cost of the three-acre lot, I thought it would be as well to try some quick growing crop that would not take up too much room, and would to as small an extent as possible retard the growth of the trees. I selected California potatoes, and treated the seed to a bath of sulphate of copper, to see if that would prevent the rot that is so prevalent in Kula.

"Last July notwithstanding the rot that did attack them, and the exceptionally dry weather that we have had all this year, I took off a crop of potatoes that *netted* me $69.19. This amount deducted from the cost, $146.90, left $77.71 or say $25.90 per acre for the three acre piece, as against $18.40 for the uncultivated acre.

"One year from planting the trees the following measurements were made:

"The tallest tree in the *uncultivated* lot was 5 feet 3 inches, a Eucalyptus Botryoides, and the average height of the whole of that piece was 3 feet.

"In the *cultivated* lot the tallest tree measured 16 feet, Euc. Rudis, the other tall ones being: Euc. Botryoides, 15 feet; Euc.

Corynocalyx, 12 feet; Euc. Leucoxylon, 12 feet; Euc. Paniculata, 12 feet; Euc. Corymbosa, 6 feet.

"The best average height, and the evenest grown lot of trees was the Euc. Botryoides; the poorest being the E. Corymbosa. The average height of the whole three-acre lot was over 10 feet. One stray (Blue Gum) Euc. Globulus, that was accidentally planted in the cultivated lot measured 12 feet in height. This tree had exactly the same treatment the others had, which goes to show pretty well, that both Rudis and Botryoides, are faster growers than the Globulus; both these species are ranked very highly in Australia for railroad ties, and fence posts. This is well to be known, especially as the Globulus, or Blue Gum, is the Eucalyptus most commonly grown at the islands, and, except for firewood, is the poorest for any purpose.

Results.

"Considering the unusually dry weather we have had for the last twelve months, I consider the growth of the trees in the cultivated lot remarkable.

"Under normal conditions, that is, where there is not a heavy growth of manienie to contend with, the cultivation of the trees should cost very much less than the amount above shown.

"The difference in favor of the cultivated as against the uncultivated trees is so great in favor of the former, that I shall favor the cultivation of all trees hereafter planted on the ranch, wherever the location is such as to make it possible.

"As showing what the possibilities are of fence post production, I would call attention to figures heretofore reported, viz: That last year I cut 244 good fence posts, five to twelve inches in diameter, from 38 second growth Eucalyptus Rostrata trees, twelve years old. Some of these posts have been put in the ground plain and the balance subjected to Creosote treatment by the Kahului Railroad Company. All of these posts will have the date stamped on them, and the place of use recorded in the ranch forestry book; so that their respective life in the ground can be ascertained accurately."

The foregoing results, I submit, are such as to more than warrant all plantations, especially those which use railroads and have large amounts of fencing to do, experimenting with cultivated forestry.

GENERAL RE-FORESTING FOR CONSERVATION PURPOSES.

This subject, like the poor, is always with us. What has been said and repeatedly re-said on this subject is today more vital to the agricultural interests of Hawaii than ever, and in no case more so than to the irrigated sugar plantations.

On every island forestry reserves have been set apart on paper, but scarce anywhere has there been anything but the most limited attempt at re-foresting.

Under normal conditions, protection from live stock would be sufficient, as the forests would reseed themselves.

For several reasons this does not take place in most locations in Hawaii. The multitudinous insects which devour the forests and a root fungus which is killing the natural woods by thousands of acres in a number of localities and the heavy growth of the Hilo grass and other coarse grasses which so cover the ground that seeds cannot germinate, are rapidly destroying forests in regions where water conservation is most needed.

Whether or not the entomologists can introduce parasites which will neutralize the deadly effect on forests of insects and fungus growths is now being made a subject of study by the Planters' Experiment Station. It will probably be far more difficult to obtain results than it has been to meet the ravages of insects directly attacking the cane; but the incidental effect upon the sugar plantations is so great that no effort should be spared to obtain results in this direction.

ARTIFICIAL REFORESTING.

Irrespective of the arrest of the decay of the forests, re-foresting should be actively taken up at an early date, on a large scale, both by the government and by private interests, or the flow of water on a number of the watersheds is liable to be seriously diminished.

The watershed most urgently in need of rescue and reforesting is that of the Kohala mountain, on Hawaii. A large portion of this, under private ownership, is still being overrun by cattle, resulting in the continued recession of the woods. A considerable area of private lands should be secured by exchange or purchase and replanted at the earliest possible date, or diminution of the water flow will certainly follow.

Next to Kohala the watershed area which, in my opinion, most seriously needs attention is that of the Ewa basin and the district of Waialua, on the island of Oahu.

The amount of water flowing or being pumped from the supply furnished by this small watershed is something enormous, amounting to several hundreds of millions of gallons per day. Droughts affect the quantity of the artesian supply, and no possible step should be left untaken to protect, conserve and increase the product of this watershed.

A paper line of forestry reservation has been located and partially fenced, but systematic tree planting to further conserve the water flow and prevent its running off in storms, should be systematically taken hold of by the plantations, which depend upon this supply for their irrigation. The government owns but little land in the district and cannot be expected to do much. So far

the only tree planting has been done by the company which is the least interested in the direct conservation of water flow, viz: the Oahu Railway & Land Company. It has, at a limited expense, made such a fine showing upon the top of the Waianae mountains that its example is worthy of emulation on a larger scale by the sugar plantations interested.

THE GOVERNMENT FORESTRY.

So far, the appropriations for government forestry have been insufficient to do anything more than create forest reserves and a skeleton of administration of the same. No appropriation has been provided for forest rangers, forest fencing or replanting, or for fighting fires. A skeleton is as essential to an advanced forest policy as it is to a man; but in the one case as in the other, it is of no practical value, except for show purposes, without the conjunction with flesh and blood. The flesh and blood necessary to make our forest administration a living organization, are appropriations to go ahead and do something with the efficient frame work already created.

I think it would be eminently sound for this Association to formally pass resolutions, recommending the coming Legislature to make appropriations for these subjects, and for the members hereof to individually interview their several Senators and Representatives, urging their support to such appropriations.

I submit herewith for consideration of this Association a form of resolution suggested:

"*Resolved,* That in the opinion of the Hawaiian Sugar Planters' Association the work of forest protection and extension is of the highest importance to the agricultural interests of this Territory;

"That in the opinion of this Association the time has arrived when liberal appropriations should be made for such protection and extension, and we hereby petition the Legislature to make liberal specific appropriations for forest fencing; for rangers to inspect and protect the forests from fire, depredation and trespass and for replanting with trees areas which have been heretofore denuded of forest."

[Note:—This resolution was unanimously adopted by the Association.]

PAPER READ AT THE ANNUAL MEETING OF THE HAWAIIAN SUGAR PLANTERS' ASSOCIATION NOVEMBER 11, 1908.

By Ralph S. Hosmer, *Superintendent of Forestry.*

Once again it is my privilege to address the members of this Association on the subject of Forestry in Hawaii. The topic is by no means a new one on the program of your annual meetings

and to some it may perhaps seem that everything necessary to a correct understanding of the subject has already been said. But there are good reasons why forestry should continue year after year to hold a place in your deliberations. Forestry is very decidedly a live issue in the Territory of Hawaii. It is a part of the general land question, than which there is no more important local problem. In Hawaii the relation between forestry and irrigation is peculiarly intimate. The continued success of the main industry of the Territory rests on the wise use of water. Over half of the fifty odd sugar plantations are dependent on irrigation. The majority of the non-irrigated plantations also use large quantities of water for fluming cane or for the development of power. Because of the characteristic features of Hawaiian climate and topography—the heavy precipitation in the windward districts and the steep, short watersheds—it is essential that a forest cover be maintained permanently on the catchment basins of the important streams. The conservation of the native forest has consequently a very direct bearing on the continued commercial prosperity of the islands.

But the benefits of forestry do not cease with forest protection. The question of meeting the demand for wood and timber of the various classes required for local use, not to speak of the need for fuel in certain districts, becomes each year more and more pressing. It is the province of forestry to meet this demand through the introduction and establishment of trees that will in time supply the required products, be the need for posts, railroad ties, construction timber, or fuel. Then too, on the side of windbreak, shelter-belt and incidentally of road-side and ornamental tree planting, forestry touches the life of this community at many points.

Taken altogether the problem of using the forests wisely and of making them do their full part constitutes one of the vital issues in the Territory of Hawaii. And because forestry is a vital, a living issue it necessarily follows that not only do new problems constantly arise, but also that the old problems frequently take on new phases or develop relations not before appreciated.

As a body the members of this Association are brought into more direct relations with forest problems than is any other class of citizens in Hawaii. It is therefore pertinent that at your meetings the underlying principles of forestry should be stated often enough to be kept clearly in mind, and that the aims, objects and present condition of current work should be made known through frequent reports of progress. It is for these reasons that forestry holds its place on your program and comes up yearly as a subject for discussion and report.

During the year of 1908 the many-sided importance of forests has come to be recognized as never before in the history of the Nation. Last May the President called together at the White House the governors of all the States of the Union to meet with

him to discuss the conservation of the natural resources of the Nation. This meeting was an event of far reaching importance for it marks the starting point of many movements that have to do with the wiser use, not only of the forests, but also of the other great natural sources of wealth—lands, minerals and waters. At the Governors' Conference, Hawaii was represented by the Governor of the Territory and by three "advisors," one of whom was the secretary of your Association.

Following the Conference of the Governors, and as a direct result of that meeting, the governors of many of the States have appointed local conservation commissions to undertake an inventory of local resources and to assist in outlining a plan whereby the material resources of the Nation as a whole can be used wisely, without waste or unnecessary loss. Governor Frear has appointed such a commission for this Territory and data are now being collected as the basis for a report that will contain specific recommendations. Many of the problems of conservation are essentially local in character and can only be solved by plans resulting from the detailed and comprehensive study of individual localities. Others are shared in common by this Territory and by the States and Territories on the mainland in a way that a better understanding of the whole subject is making more and more clear. In so far as Hawaii has taken part in this general movement it is unquestionably the most notable event in the history of forestry in the Territory during the past year.

With the widening in scope of the general outlook the work of the Territorial Forest Service has gone steadily forward. Pursuing the policy adopted at its organization, five years ago, there have been set apart during the past year additional forest reserves amounting in area to 46,429 acres, of which 21,094 acres, or 45 per cent., is Government land. This brings the total area of the Hawaiian forest reserves, now sixteen in number, up to 444,116 acres, of which 273,912 acres, or 61 per cent., belongs to the Government. Forest Reserve projects amounting to a total of 62,180 acres now only await formal action by the Board of Agriculture and Forestry and the Governor before being set apart. The most important forest reserve projects now pending are the proposed Kohala Mountain Forest Reserve on Hawaii, and the proposed Lihue-Koloa and Kilauea-Aliomanu Forest Reserves on Kauai. With the setting apart of the two last named proposed reserves, the entire upland region in the central part of Kauai will be included within the forest reserve limits, making Kauai the first island on which the reserve system has been brought to completion.

Reference to the forest reserves brings up a matter in which this Association can by its influence and support be of material assistance in strengthening the forest policy of the Territory. As has been frequently pointed out the primary value of the Hawaiian forest lies in the protective influence it exerts on the

watersheds of the streams needed for irrigation. Consequently practically all the forest reserves are essentially protection forests, which it is desirable should be held strictly intact. This means that the reserves must be protected from fire, from cattle and from other forms of trespass, and must be rid of wild goats and other destructive animals. So far as possible the boundaries of the reserves are made to follow natural barriers. But it often happens that there are stretches where fencing is required. In many cases a short stretch of fence, as for example between two gulches, will protect a large area. Often such stretches of fence should be on Government land where it is impracticable to make fence building a condition of a Government lease. To meet such contingencies and also to provide for the fencing jointly by the Government and a given corporation of certain forest lines, there should be available an appropriation on which the Division of Forestry could draw. The amount need not be large. Five thousand dollars would go a long way in such work. But some money certainly should be available.

Two further matters of similar tenor should also be mentioned in this connection—the inauguration of a definite system of administration of the forest reserves by forest rangers, paid out of Territorial funds and responsible only to the Territorial forest officials; and second, the appropriation of a fund, to be used only in case of emergency, from which could be paid expenses incurred in fighting forest fires. Not until the Hawaiian forest reserves are properly protected by the necessary fences, and adequately guarded against fire and trespass by a forest ranger force, backed by an appropriation for fighting fire, can the reserves do their full duty or be made of the greatest benefit to the Territory.

In saying this I do not forget the excellent work that has for many years been done by a number of the large plantation companies in carefully protecting their own forest lands, nor do I under-estimate the strong sentiment in favor of forestry that has made possible what has already been accomplished by the Territorial officials. But looking to the future, as it is essentially the business of the forester to do, I cannot but urge most strongly that the members of this Association, both collectively and as individuals, exert whatever influence they may have to secure from the coming Legislature appropriations sufficient for these purposes.

The second main line of forest work in Hawaii is tree planting. It was in this way that both the Government and the private owner began to practice forestry in this Territory. I do not need to remind you of the good work that has been done with increasing interest for the past thirty years. But I do want to bring home to you all the desirability—nay the necessity, of doing more of it.

In Hawaii there are four main objects in tree planting. First, commercial return, be the need for posts, railroad ties, construc-

tion timber or fuel. Second, to provide shelter belts or wind breaks. Third, road side and ornamental planting. And fourth, to extend and supplement the native forest in sections where the forest cover is unquestionably of value as a means of controlling the run-off and making available for use a larger percentage of the precipitation either on the surface or as an underground supply.

Let me speak of the last named case first. As a typical example I have in mind the Ewa Basin on this island. Practically all the water for the plantations about Pearl Harbor comes from streams draining the Koolau Mountains or from artesian wells supplied by underground water from the same source. The rain that falls on the Waianae Mountains is important as far as it goes, but it is and always must be only a fraction of what results from the precipitation on the Koolau Range. As it is now much of the rainfall on these mountains gets away as flood water and escapes the duty it might be made to perform, either by helping to fill the high level irrigation ditches or as underground water to assist in keeping up the water-table for a longer time in succeeding periods of drought. There is a belt above the cane fields and other agricultural land in the Ewa Basin that it would pay to get back under forest for the good it would do in holding some of the water that now escapes. The planting up of this belt is a case where all three plantations could well get together and coöperate. Needless to say the Division of Forestry would be glad to assist in any way possible in this or any other similar tree planting project.

I hope that in time the Division of Forestry may have at its command sufficient funds to begin tree planting again on Government land. But at present I believe more good can be accomplished by expending what money is available in assisting private owners and in the way of plant introduction.

During the past year systematic relations of seed exchange have been established with over one hundred botanic gardens and other similar institutions in various parts of the world. By this means there have been received at the Government Nursery the seed of numerous trees and shrubs new to the Territory, some of which are sure to prove of very considerable economic value. To facilitate this work an experimental garden has been made in upper Makiki Valley where the plants started in the specially constructed germination houses at the nursery can be propagated for subsequent distribution. As soon as practicable the new trees and shrubs will be sent out to localities on the other islands where from situation, elevation and aspect they may be expected to do well. In addition to the experimental garden at Makiki, it is hoped to establish regular sub-gardens on the other islands, which shall eventually become centers of distribution. One such station is about to be made at Kalaheo on Kauai where Mr. Walter D. McBryde has consented to coöperate with the Division of Forestry

by overseeing the work. The great interest in tree planting that Mr. McBryde has already shown, both by his own planting and by what he has got his neighbors to do, argues well for the success of this undertaking. Eventually I hope that similar gardens for the systematic trial and propagation of valuable exotic plants may be established on each island.

Somewhat in line with this work is the experimental tree planting on the high slopes of Mauna Kea and Haleakala about to be undertaken with the coöperation of the Federal Forest Service. The object of these experiments is to try some of the conifers—pines, spruces and firs—of the temperate zone at elevations above the native Hawaiian forests, with the expectation of obtaining data that will lead eventually to the clothing of those now barren mountain slopes with a forest of valuable trees. An allotment of Forest Service funds made last year for this work was later withdrawn. This year the money ($2,000) was again secured. As soon as the necessary formalities are complied with the work of actual planting will be begun.

I said a few moments ago that there were four main objects in tree planting in Hawaii and proceeded to outline what might be done under one of them. Let us now briefly consider planting for commercial returns, which is far and away the most important form of tree planting in Hawaii. Every sugar plantation in the islands needs a constant supply of wood and timber. Many must provide for a supply of fuel as well. The price of all kinds of lumber, even of the ordinary rough grades, has for some years been going steadily up. From the outlook on the mainland it is evident that a further rise is to be expected. With the increasing demand for all forms of wood and the steadily diminishing supply the outlook cannot be otherwise. In his address before this Association at its annual meeting last year, Mr. Thurston brought forward facts and figures that cannot be disputed. The situation today is that we are one year nearer the time when the pressure of a wood famine will begin keenly to be felt. The only remedy is to plant trees and to begin at once.

Practically every sugar plantation in the islands has areas of waste land that is good for no other purpose, but which will serve excellently for producing wood of the kinds specially adapted for the needs of that particular plantation.

The Division of Forestry has the necessary information as to what kinds of trees to plant to obtain certain results under varying conditions of exposure, aspect and elevation. This information is free and to be had for the asking.

Further, at the bare cost of his traveling expenses, Mr. David Haughs, the Forest Nurseryman of the Division of Forestry, an experienced tree planter, long familiar with island conditions, will visit any locality and prepare a regular planting plan, showing in detail just what to plant and where and how to go about the work.

The cost of planting per acre varies of course with the locality.

But there is probably not a plantation in the Territory where the planting of certain gulch sides or other patches of waste land with trees would not be a good investment.

A word on the personal side. Someone may object that tree planting is a thankless job for the man who does the work in that someone else enjoys the returns. Here in Hawaii this is less true than it is elsewhere for our trees grow rapidly and usually one has the advantage of being able to reap what he himself has sown. But supposing he does not. The members of this Association are broad-gauge men who should be glad to do something for the future welfare of the properties in which they are now interested, if not for the good of the country. And again, what better memorial can a man leave than a grove of thrifty, well grown, valuable trees. Think a moment of the tree planting that has been done in your district and ten to one you will find that some one man's name is associated with it.

According to a list that I made out last spring the following plantations are now actively engaged in tree planting, on a larger or smaller scale:

KAUAI.

McBryde Sugar Company, Eleele.
Koloa Sugar Company, Koloa.
Grove Farm Plantation, Lihue.
Lihue Plantation Company, Lihue.
Makee Sugar Company, Kealia.

OAHU.

Waianae Company, Waianae.
Kahuku Plantation Company, Kahuku.

MAUI.

Wailuku Sugar Company, Wailuku.
Hawaiian Commercial & Sugar Co., Puunene.
Maui Agricultural Company, Paia.

HAWAII.

Kohala Sugar Company, Kohala.
Halawa Plantation Co., Kohala.
Paauhau Sugar Plantation Co., Hamakua.
Hamakua Mill Company, Paauilo.
Hakalau Plantation Company, Hakalau.
Pepeekeo Sugar Company, Pepeekeo.
Honomu Sugar Company, Honomu.
Hawaiian Agricultural Company, Pahala.

This is a good list and means that the men who are responsible for the work are level headed and far sighted individuals. But the list should be much longer. It ought to be made a sort of Roll of Honor on which the names of all the plantations should appear. Why should this not happen before the next Planters' Association meeting? If you gentlemen will take the matter to heart it can be done. We are all interested in the continued prosperity of Hawaii nei. Will you not in this way help the Territory while you help yourselves by providing for a wood supply in future years?

HAWAIIAN ENTOMOLOGICAL SOCIETY PROCEEDINGS.

The first number of volume two of the Proceedings of the Hawaiian Entomological Society has recently been published, and contains many valuable articles upon local and general entomology.

Among many interesting papers that by Mr. Swezey, upon the life history of *Chaetogaedia monticola* calls for especial mention. It has till now been believed that this Tachina fly deposited its eggs within the body of its host, and entomological literature generally states this conclusion. Certain considerations led the writer of the article alluded to, to question this belief with the result that in February of this year his investigations were rewarded by an actual observation of this fly in the act of ovipositing. Mr. Swezey has now demonstrated that the minute eggs are deposited upon the daily food of the future host, with which they are swallowed by the caterpillar, within whose body they are hatched and matured.

We congratulate Mr. Swezey upon bringing to such a satisfactory conclusion his original investigations upon the life history of this hitherto little understood insect.

To the general reader probably the greatest interest will attach to Mr. Jacob Kotinsky's article upon the present status of *Orthesia insignis.* To those who are not familiar with entomological nomenclature, it will suffice to say that the pest alluded to is the cause of the blackened appearance of the lantana. While this insect is undoubtedly a menace to many plants, its destruction of lantana commended it to ranchmen, who heedless of the detrimental effects of its indiscriminate diffusion, introduced it generally throughout the islands with the intention of ridding their pastures of lantana.

It was first discovered on Maui in 1899, but it was not until about four years ago that it began to be noticeable on this island, several patches of it appearing about that time on the other side of Nuuanu Pali. Although there is no doubt that this pest has proved of great value to the cattlemen it is open to question whether it will not before long attack plants of economic value.[1] The fact too must not be overlooked that the extermination of lantana upon otherwise barren land is by no mean to be desired, as this generally exercrated plant has undoubtedly done splendid work in the formation of soil upon such waste places.

Messrs. Perkins, Muir and Kirkaldy are also contributors to the number.

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[1] Mr. Kotinsky records that *Orthezia insignis* is actually killing among other plants: Coleus, Alternanthera, Gardenia and Meyenia.

LAW AND REGULATIONS PERTAINING TO THE IMPORTATION AND INSPECTION OF HONEY BEES AND HONEY INTO THE TERRITORY OF HAWAII.

ACT 69, SESSION LAWS OF 1907.

An Act to Amend Chapter 28 of the Revised Laws of Hawaii by Adding to said Chapter a Section to be Known as Section 389A.

Be it Enacted by the Legislature of the Territory of Hawaii:

Section 1. Chapter 28 of the Revised Laws of Hawaii is hereby amended by adding a new section thereto to be known as Section 389A and to read as follows:

Section 389A. It shall be the duty of the Board to make rules and regulations, and to amend the same from time to time, in its discretion, subject to the approval of the Governor, for and concerning the importation into the Territory of bees and for the preservation, protection and improvement of bees now within the Territory; and for the quarantine, inspection, fumigation, disinfection, exclusion or destruction either upon importation into the Territory or at any time or place within the Territory of any bees and any box or other container and their contents in which bees have been imported or contained, which is or may be infested with or liable to assist in the transmission or dissemination of any insect or disease injurious to bees. All rules and regulations made as aforesaid shall have the force and effect of law. It shall be the duty of the Board to establish an observational apiary and all bees imported into the Territory shall be there quarantined free of cost to the owners until such time shall have elapsed as to enable the proper entomologist or inspector of the Board, to certify to the owners that such bees are clean and free from disease. The entomologists or inspectors of the Board may enter upon the premises of any bee keeper for the purpose of inspecting apiaries, and of carrying out the orders of the Board, and they shall not be holden guilty of any misdemeanor by so doing nor shall they be personally liable in damages except for acts beyond the scope of their authority or due to their own negligence.

Section 2. This Act shall take effect from and after the date of its approval.

Approved this 17th day of April, A. D. 1907.

G. R. Carter,

Governor of the Territory of Hawaii.

RULES AND REGULATIONS PERTAINING TO THE IMPORTATION AND INSPECTION OF HONEY BEES AND HONEY INTO THE TERRITORY OF HAWAII BY THE BOARD OF AGRICULTURE AND FORESTRY.

Rule 4. Importation of Queen Bees.

In order to prevent the introduction into this Territory of infectious, contagious or communicable diseases among honey bees it is hereby ordered that

All queen bees imported into the Territory of Hawaii shall be subject to the following terms and conditions hereinafter set forth, namely:

(1). *Labels.* A label shall be affixed to the cage, box or other container in which any queen bee is enclosed, which label shall set forth:

(a) The number of queen bees enclosed;
(b) The locality where each was produced;
(c) The locality from which each was shipped;
(d) The name of the shipper;
(e) The name of the consignee.

(2). *Request for Inspection.* The importer shall file with the Board of Agriculture and Forestry, at least two weeks prior to the date at which the queen bee or bees will arrive, a written statement signed by himself or his agent or attorney which shall set forth his purpose to import said queen bee or bees into the Territory of Hawaii, which statement shall contain as accurately and fully as possible the following information:

(a) The number of queen bees sought to be imported;
(b) The probable locality where each was produced;
(c) The locality from which each is expected to be shipped;
(d) The name of the proposed shipper;
(e) The address of the importer, and shipping marks.

Said statement shall also contain a request that the Board, upon arrival of said queen bee or bees, proceed forthwith to inspect or cause to be inspected such queen bee or bees.

(3). *Inspection.* Immediately upon the receipt of such request for inspection or as soon thereafter as may be an inspector of the Board shall inspect each queen bee and if it is found free from such disease shall cause it to be transferred from any cage, box or other container in which it shall have been imported and shall transfer it to a new and clean cage properly supplied with clean and fresh candy and with sufficient bees known to be free from disease to properly care for said queen bee.

(4). *Certificate.* The inspector shall thereupon give to the importer a certificate of his findings upon such inspection and deliver to him such of the bees as he finds free from all infectious, contagious and communicable diseases.

(5.) *Destruction of Cages, Bees, etc.* Immediately upon the transfer of any queen bee from any cage, box or other container as set forth in Section 3 hereof, said inspector shall cause to be burned and destroyed such cage, box or other container, together with the candy and bees therein, excepting such queen bee.

If said inspector shall at said inspection find any queen bee to be infected with any contagious, infectious or communicable disease he shall in his discretion destroy the same or hold the same for further treatment.

Rule 5. Importation of Honey.

In order to prevent the introduction into this Territory of infectious, contagious or communicable diseases among honey bees and in view of the fact that such diseases are in the majority of cases communicated by the introduction into uninfected territory, of honey, honey-dew or syrup containing honey from districts in which such infetious, contagious or communicable diseases exist, it is hereby ordered that

All honey, honey-dew or syrup containing honey imported into the Territory of Hawaii, shall be subject to the following terms and conditions, to-wit:

(1). *Statement by Importer.* Any person or persons importing into the Territory of Hawaii any honey, honey-dew or syrup containing honey from the mainland of the United States or elsewhere, upon arrival of such honey, honey-dew or syrup containing honey at a port of entry of the Territory of Hawaii, and before such honey, honey-dew or syrup containing honey shall have been landed upon the dock, or if such honey shall have been landed upon the dock without the knowledge of the importer, then before such honey, honey-dew or syrup containing honey shall have been removed from the dock, shall file with the Board a written statement containing the following information:

(a) The port from which such honey was shipped;

(b) The name of the shipper;

(c) Whether or not the same has been certified by a qualified inspector as hereinafter set forth.

Said statement shall also contain a request that the Board forthwith proceed to have said honey, honey-dew or syrup containing honey inspected, and an agreement on the part of the importer to be responsible for all reasonable costs and expenses of inspection, quarantine and care of the same.

(2). *Inspection.* Immediately upon the receipt of such statement or as soon thereafter as may be, the Board shall cause said honey, honey-dew or syrup to be inspected by its inspector. In case such honey shall bear upon the containers thereof or shall be accompanied by a certificate of a qualified officer of any state or of the United States or other country, that the honey is from healthy colonies of bees, that is, from colonies of bees not affected

with any infectious, contagious or communicable disease, then said honey shall be forthwith passed by said inspector and said inspector shall thereupon furnish to the importer thereof a permit to land the same or to remove the same from the dock as the case may be.

In case such honey shall not bear upon its containers, or shall not be accompanied by a certificate from a duly qualified officer as aforesaid that the same comes from healthy colonies of bees as above set forth, then such inspector shall cause said honey to be removed to some place there to undergo such tests as the Board shall from time to time prescribe to determine whether or not said honey, honey-dew or syrup containing honey is infected with any infectious, contagious or communicable disease. Upon the completion of such tests said inspector shall certify his findings. If said honey shall be found free from any diseases as above set forth said inspector shall so certify and shall thereupon deliver such honey, honey-dew or syrup containing honey to the said importer. If, however, such honey shall be found infected with any infectious, contagious or communicable disease, the inspector shall forthwith notify the importer of such fact and such importer shall have a reasonable time thereafter to return or export said honey to some port without the Territory of Hawaii. But should said importer refuse to return or export said honey, or neglect so to do within a reasonable time, then said honey shall be destroyed in such manner as shall be determined by the Board.

These rules and regulations were approved at a meeting of the Board of Commissioners of Agriculture and Forestry, held on September 2nd, 1908.

(S) C. S. HOLLOWAY,

President and Executive Officer
Board of Agriculture and Forestry.

Approved:

(S) W. F. FREAR,

Governor.

Sept. 17, 1908.

BEE KEEPERS' MEETING.

The annual meeting of the Hawaiian Bee Keepers' Association took place on December 10th last. An account of this important event will be given in the January number.

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To give information about insects free of charge is one of the duties of this Division and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief we like and sometimes it is indispensable for us to see the insect suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed at 3rd class rates. When specimens are not accompanied by letter *always* write your name and address in the upper left-hand corner of the package. Address all communications SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 331, HONOLULU, HAWAII.

JACOB KOTINSKY,
Acting Superintendent.

DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizzia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from $1.00 to $2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haughs, Forest Nurseryman, Box 331, Honolulu, Hawaii.

RALPH S. HOSMER,
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PUBLICATIONS FOR DISTRIBUTION.

Any one or all of the publications listed below (except those marked *) will be sent to residents of this Territory, free, upon application to Mailing Clerk, P. O. Box 331, Honolulu.

BOARD.

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* First Report of the Board of Commissioners of Agriculture and Forestry, from July 1, 1903, to December 31, 1904; 170 pp.
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"Notice to Importers," by H. E. Cooper; 4 p.; 1903.
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DIVISION OF ANIMAL INDUSTRY.

"Inspection of Imported Live Stock." Rule 1; 1 p.; 1905.
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